DRAFT

SITE-SPECIFIC WORK PLAN FOR THE PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION AT RICKENBACKER ANGB, OHIO

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Prepared for

US Army Corps of Engineers, Omaha District

and

Air Force Center for Environmental Excellence Technology Transfer Division

and

Air Force Base Conversion Agency

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LIST OF ACRONYMS AND ABBREVIATIONS

μg/L micrograms per liter
AFB Air Force Base

AFBCA Air Force Base Conversion Agency

AFCEE/ERT Air Force Center for Environmental Excellence, Technology Transfer

Division

BCT Base Realignment and Closure (BRAC) Cleanup Team

BGMP Basewide Groundwater Monitoring Program

BRAC Base Realignment and Closure

COC contaminant of concern

DCA dichloroethane DCE dichloroethene

DoD Department of Defense HASP Health and Safety Plan

IRP Installation Restoration Program
IT International Technology Corporation
MNO monitoring network optimization

OHANG Ohio Air National Guard

Parsons Parsons Engineering Science, Inc.
PDBS passive diffusion bag sampler

QA quality assurance

RANGB Rickenbacker Air National Guard Base

RL reporting limit

RPA Rickenbacker Port Authority
RPD relative percent difference
RPO remedial process optimization
SAP Sampling and Analysis Plan

Shaw Environmental and Infrastructure, Inc.

TCA trichloroethane TCE trichloroethene

USACE US Department of the Army, Corps of Engineers

USEPA US Environmental Protection Agency

VC vinyl chloride

VOC volatile organic compound

1.0 INTRODUCTION

1.1 Project Description and Location

On 22 January 2002, Parsons Engineering Science, Inc. (Parsons) was awarded delivery order DK01 under US Department of the Army, Corps of Engineers (USACE) Contract Number F44650-99-D-0005. The scope of this delivery order is to provide services, technical labor-hours, and materials to support Remedial Process Optimization (RPO) evaluations and demonstrate the effectiveness of Passive Diffusion Bag Samplers (PDBSs) for sampling volatile organic compounds (VOCs) in existing groundwater monitoring programs at selected Base Realignment and Closure (BRAC) sites administered by the Air Force Base Conversion Agency (AFBCA). The Technology Transfer Division of the Air Force Center for Environmental Excellence (AFCEE/ERT) has initiated the PDBS demonstration to introduce this technology to multiple Department of Defense (DoD) installations and to improve the cost effectiveness of groundwater monitoring programs for VOCs. This site-specific work plan is for the demonstration of the PDBS technology at Rickenbacker Air National Guard Base (RANGB), Columbus, Ohio.

Diffusion sampling is a relatively new technology designed to utilize passive sampling techniques that eliminate the need for well purging. Specifically, a diffusive-membrane capsule is filled with deionized/distilled water, sealed, suspended in a well-installation device, and lowered to a specified depth below the water level in a monitoring well. Over time (no less than 72 hours), the VOCs in the groundwater diffuse across the membrane, and the water inside the sampler reaches equilibrium with groundwater in the surrounding formation. The sampler is subsequently removed from the well, and the water in the diffusion sampler is transferred to a sample container and submitted for laboratory analysis of VOCs. Benefits of diffusion sampling include reduced sampling costs and reduced generation of investigation-derived waste.

1.2 Objectives

The PDBS demonstration at RANGB has three primary objectives:

- Develop vertical profiles of VOC concentrations across the screened intervals of the sampled monitoring wells;
- Assess the effectiveness of the PDBS method by statistically comparing
 groundwater analytical results for VOCs obtained using the current (conventional)
 sampling method (i.e., micropurge) with results obtained using the PDB sampling
 method. VOC results from the scheduled November 2002 Basewide Groundwater
 Monitoring Program (BGMP) event will be compared to the results obtained using
 the PDBS method; and
- Compare the costs of PDB and conventional sampling.

Vertical contaminant profiles will be developed by placing PDBSs at discrete depths within the saturated screened interval of each monitoring well included in the

demonstration, and analyzing the resulting samples for VOCs. The resulting information will aid the Base in evaluating contaminant migration in the saturated zone, and will allow optimization of the Basewide groundwater sampling and analysis program. The statistical comparison of the conventional and diffusion sampling results will allow assessment of the appropriateness of implementing diffusion sampling for VOCs at each sampled well.

A secondary objective of this project is to evaluate the adequacy and appropriateness of a portion of the groundwater monitoring program at RANGB using a three-tiered optimization approach (monitoring network optimization [MNO]). This approach consists of a qualitative evaluation, an evaluation of temporal trends in contaminant concentrations, and a spatial statistical analysis. The evaluation assesses the frequency of monitoring, as well as the number and location of wells in the monitoring network to determine an efficient and effective monitoring network for the site. Ultimately, recommendations are developed to optimize the groundwater monitoring program.

1.3 Scope

The sampling demonstration at the RANGB will require two mobilizations to the site-one to place the diffusion samplers in the selected monitoring wells, and a second to retrieve the samplers from the wells. The PDBSs will be installed in October 2002 to provide adequate equilibration time before the current sampling contractor for RANGB, Shaw Environmental and Infrastructure, Inc. (Shaw), formerly IT Corporation (IT), begins the scheduled BGMP sampling event in November 2002. There are no dedicated pumps in any of the monitoring wells selected for the PDBS demonstration. To the extent feasible, the PDBSs will be retrieved immediately prior to the conventional sampling at the selected locations to ensure temporal comparability of the analytical results obtained using the two methods. The PDBSs will be in place for a minimum of 14 days, which fulfills the 14-day minimum equilibration time period specified in the Draft BRAC PDBS Project Work Plan (Parsons, 2002).

For the MNO, locations and completion intervals of individual monitoring wells and sampling points will be examined, and the informational contribution of each well or sampling point to the network will be weighed against the cost of monitoring at that point. Monitoring protocols and analytical methods also will be evaluated. Where warranted, recommendations will be developed for optimization of the portion of the monitoring network that is evaluated. Methods to be used in the evaluation will include, but are not limited to, qualitative hydrogeologic and hydrochemical analyses, application of statistical optimization techniques, and application of decision-logic structures.

1.4 **Document Organization**

This work plan is organized into seven sections, including this introduction, and three appendices. The site description summarized from the *Remedial Action Decision Document for IRP Sites 2, 21, 41, 42 and 43* (IT, 1999) and the *Final Phase II – Remedial Investigation Report* (IT, 1998) is presented in Section 2. Section 3 presents the scope of the PDBS investigation at RANGB. Project organization, schedule, and an overview of the PDBS site-specific results report are summarized in Sections 4, 5, and 6, respectively. References used in the preparation of this work plan are presented in

Section 7. Appendix A provides a site-specific addendum to the Program Health and Safety Plan (HASP) (Parsons, 2002). Historic site-specific groundwater quality data for RANGB is provided in Appendix B; these data were obtained from the *Technical Review CD* (IT, 2002b). Appendix C presents selected pertinent field procedures from the *Final Field Sampling Plan* (IT, 2000).

2.0 FACILITY DESCRIPTION

2.1 Location and Description of Rickenbacker ANGB

RANGB is located approximately 12 miles southeast of downtown Columbus, Ohio. The Base is bordered by residential, commercial, and industrial areas to the north; Little Walnut Creek and rural land to the east; rural land to the south, and the Village of Lockbourne to the west. The area surrounding the former Base is mostly rural, with the immediate vicinity having industrial, commercial, residential, and recreational land uses.

The Army Air Corps started construction on Rickenbacker in January 1942, and operated the Base until 1980. Rickenbacker was originally named the Northeastern Training Center and was later renamed the Lockbourne Air Force Base (AFB). By the end of 1942, the Base consisted of 1,574 acres and included a north-south runway and an east-west runway. In 1951, the current runway configuration was constructed by the Strategic Air Command, and the Base grew to over 4,000 acres. In 1974, the Base was renamed Rickenbacker AFB after World War I Captain Edward V. Rickenbacker. In 1980, the Base was closed and transferred to the Ohio Air National Guard (OHANG). In 1984 and 1985, OHANG transferred approximately 1,600 acres to the Rickenbacker Port Authority (RPA).

In the meantime, the DoD developed the IRP to identify, assess, and control potential environmental contamination that may have resulted from past operations and waste disposal practices at defense facilities. At RANGB, the IRP is funded and administered by the AFBCA, and was initiated in 1986 with the *Preliminary Assessment*. Since 1986, and through the 1990s, several sites at RANGB have been investigated and closed under various regulatory programs. On 12 April 1991, RANGB was announced as a candidate for closure. A three-person BRAC Cleanup Team (BCT) was created in January 1994 to investigate and make the decisions related to environmental cleanup actions at RANGB. In 1994, RANGB officially closed. During a feasibility study in 1996, five sites were determined to have a sufficiently high risk from potential commercial, industrial, and residential exposures to warrant an evaluation of potential technologies for remedial action (Sites 2, 21, 41, 42, and 43).

2.2 Geology and Hydrogeology

Six hydrogeologic units are present beneath RANGB. From shallowest to deepest these units are:

• An upper water-bearing zone occurring in the glacial till deposits associated with the second stage of Wisconsin glaciation;

- An aquitard of very hard silt and clay with varying amounts of sand and gravel deposited from the under surface of the glacier during the second stage of Wisconsin glaciation;
- An intermediate aquifer of sand, gravel, and till outwash deposited between advances of the Wisconsin ice sheet;
- An aquitard of silt and clay deposits with varying amounts of sand and gravel deposited during the first stage of Wisconsin glaciation;
- A deep aquifer of sand and gravel deposits with relatively few fines associated with outwash deposits from Illinois glaciation; and
- An aquitard in carbonaceous or argillaceous Ohio and Olentangy shale.

The wells selected for use in this PDBS demonstration at RANGB are screened in the glacial till deposits of the surficial water-bearing zone. This water-bearing zone is composed of silt and clay with varying amounts of sand and gravel deposited during the end of the second stage of Wisconsin glaciation by melting ice with localized deposition of fluvioglacial sand and gravel. Recharge to the water-bearing deposits occurs through infiltration from precipitation and from surface water bodies. The inflow of water to the shallow aquifer locally affects groundwater flow patterns and contaminant transport. The estimated average hydraulic conductivity of the upper water-bearing zone is 1 x 10⁻⁴ centimeters per second (1.83 feet per day). A contour map of the surficial aquifer water table is provided in Appendix B.

2.3 Nature and Extent of Contamination

The contaminants of concern (COCs) in groundwater beneath the AFBCA property at RANGB include acetone, benzene, 1,2-dibromo-3-chloropropane, *cis*-1,2-dichloroethene (DCE), 1,2-dichloroethane (DCA), 1,1-DCE, 1,2-DCE (total), ethylbenzene, toluene, 1,1,2-trichloroethane (TCA), trichloroethene (TCE), vinyl chloride (VC), arsenic, and thallium (IT, 2002a). Groundwater contamination at RANGB consists of separate plumes under each of the addressed sites (Sites 2, 21, 41, 42, and 43). The COCs at each site are:

- Site 2: benzene;
- Site 21: cis-1,2-DCE, TCE, VC, 1,2-dibromo-3-chloropropane, and thallium;
- Site 41: 1,2-DCE (total), benzene, *cis*-1,2-DCE, ethylbenzene, toluene, TCE, VC, acetone, and thallium;
- Site 42: benzene, cis-1,2-DCE, VC, TCE, and arsenic; and
- Site 43: benzene, *cis*-1,2-DCE, VC, TCE, and thallium.

Quarterly sampling results and historical data for each of these sites are presented in Appendix B. In addition, a technical review provided by Shaw is included in Appendix B, which details respective contaminant plumes for each site from 1999 and 2002.

3.0 SCOPE OF PDBS DEMONSTRATION

An estimated total of 68 samples will be collected from 20 monitoring wells located in and immediately adjacent to Sites 2, 21, 41, 42, and 43 as part of this project (not counting quality assurance [QA] samples). The locations of these sites are shown on Figure 3.1. The 20 monitoring wells have been chosen because they 1) are located in or adjacent to one of the sites, 2) are sampled for VOCs and contained detectable concentrations of at least one targeted COC between November 2000 and November 2001, and 3) are included in the BGMP sampling event scheduled for November 2002. However, a limited number of wells that have not contained detectable VOC concentrations also have been scoped for PDB sampling to confirm the lack of VOCs throughout the saturated screen interval. The monitoring wells that will be sampled during this PDBS demonstration are summarized in Table 3.1, and their locations are shown on Figures 3.2 through 3.6. Additional PDB samples may be collected from selected wells at Site 1; however, as of the date of this work plan, sufficient data regarding Site 1 wells (i.e., well construction details) had not been obtained to determine which wells (if any) were appropriate for inclusion in this demonstration project. Parsons is in the process of obtaining the missing information, and any additional sampling recommended at this site will be outlined in the final work plan.

3.1 Field Activities

Monitoring wells selected for VOC sampling using the PDBS technique (Table 3.1) were chosen from the list of monitoring wells targeted for sampling by Shaw in November 2002. Monitoring well selection was based primarily on VOC concentrations detected during previous sampling events. None of the wells selected for sampling contain dedicated sampling pumps.

PDBSs deployed during this investigation will be installed and retrieved in general accordance with the diffusion sampler installation and recovery standard operating procedures presented in Appendix B of the AFBCA PDBS Project Work Plan (Parsons, 2002). PDBSs will be installed throughout the screened interval of each well (i.e., 1 PDBS per 3 feet of saturated screen) to obtain a vertical profile of contaminant concentrations. The PDBSs will be collected prior to the November 2002 conventional sampling event completed by Shaw.

Sample aliquots from PDBSs installed in the 16 wells targeted for sampling will be shipped to Paragon Analytics, Inc. in Fort Collins, Colorado for VOC analysis using US Environmental Protection Agency (USEPA) Method 8260B. This is the same laboratory and analytical method that will be used by Shaw for their conventional sampling of the same wells. The analyses will be performed in accordance with the Shaw's *Final Quality Assurance Project Plan Remedial Action Operations for Sites 2, 21, 41, 42, and 43* (IT, 2001). Field QA samples will be collected at the following frequencies:

- 10 percent field duplicates,
- 5 percent matrix spikes and matrix spike duplicates,
- 1 pre-installation equipment rinseate,
- 1 pre-installation source water blank, and
- Approximately 4 trip blanks (1 per cooler of samples).

TABLE 3.1 SAMPLING LOCATION SUMMARY PASSIVE DIFFUSION BAG SAMPLER DEMONSTRATION RICKENBACKER ANGB, OHIO

Well ID	Total Depth (ft btoc) ^{a/}	Well Diameter (inches)	Screened Interval (ft btoc)	Screen Length (feet)	Top of Casing Elevation (ft amsl) ^{b/}	Depth to Water February 2002 (ft btoc)	Groundwater Elevation February 2002 (ft amsl)	Estimated Number of PDBSs	Maximum Concentrati (November 2000 - N	• • /
			,						CAHs ^{d/}	Fuels and Acetone
Site 2										
02MW007	15.00	2	5.00 - 15.00	10	732.20	5.68	726.52	1	ND ^{e/}	6.8 J(benzene)(Nov 01)
02MW010	19.00	2	7.00 - 17.00	10	731.30	5.86	725.44	4	ND	67 D(benzene)(May 01)
02MW101	14.50	2	4.00 - 14.00	10	732.79	6.38	726.41	3	ND	1 J(benzene)(May 01)
02MW102	15.60	2	5.00 - 15.00	10	728.20	4.18	724.02	4	ND	3.9 (benzene)(Feb 01)
Site 21									57 (cis-1,2-DCE)(Nov 01); 2.2	
21MW003	16.30	2	5.80 - 15.80	10	738.50	2.60	735.90	4	J(TCE)(Nov 01); 8.5 (VC)(Nov 01)	ND
21MW004	20.00	2	7.00 - 17.00	10	738.06	3.50	734.56	5	0.89 J(cis-1,2-DCE)(Aug 01); 1.1 (TCE)(Aug-01)	ND
Site 41										
10MW001	15.00	2		10	742.60	4.63	737.97	4	0.36 J(TCE)(Aug 01)	0.58 J(benzene)(Aug 01); 0.49 J(ethylbenzene)(Nov 01)
41MW102	20.00	2	8.00 - 18.00	10	741.49	5.65	735.84	4	95 D(cis-DCE)(May 01); 95 D (total- DCE)(May 01); 540 D(TCE)(May 01); 5 (VC)(May 01)	370 B(acetone)(Nov 01)
41MW103	20.00	2	9.00 - 19.00	10	741.59	5.72	735.87	4	7400 D(cis-DCE); 7540 D(total- DCE); 10 (TCE)(May 01); 3400 (VC)(Nov 01)	1100 D(acetone)(Aug 01); 29 J(benzene)(Nov 01), 1.3 (toluene)(Nov 01)
41MW104	16.00	2	6.00 - 16.00	10	741.92	5.86	736.06	3	3700 D(cis-DCE)(Nov 00); 3700 D(total-DCE)(Nov 00); 240 D(TCE)Nov 01); 2800 D(VC)(Nov 00)	300 BD(acetone)(Feb 01); 19 (benzene)(Nov 00); 0.31 J(toluene)(Nov 01)
41MW105	20.00	2	9.00 - 19.00	10	741.61	6.08	735.53	4	13 (cis-DCE)(Aug 01); 13.95 (total-DCE)(Aug 01); 20 (VC)(Nov 00)	5 JB(acetone)(Dec 01); 0.69 J(benzene)(Dec 01)
Site 42										
42MW101	14.50	2	4.00 - 14.00	10	738.17	2.68	735.49	4	0.19 J(cis-DCE)(Aug 01); 5 (VC)(Nov 00)	1.2 (benzene)(Dec 01)
42MW102	13.50	2	3.00 - 13.00	10	740.51	7.16	733.35	2	2.3 (cis-DCE)(Aug 01); 0.54 J(TCE)(Dec 01); 0.23 J(VC)(Aug 01)	ND
									12 (cis-DCE)(May 01); 10 D(TCE)(Nov 01); 68 D(VC)(Nov	
42MW103	14.50	2	4.00 - 14.00	10	739.88	8.52	731.36	2	00)	ND
42MW104	16.00	2	6.00 - 16.00	10	738.08	2.36	735.72	5	220 D(Nov 00)	ND
42MW105	16.00	2	6.00 - 16.00	10	740.05	7.45	732.60	2	1.1 J(cis-DCE)(Aug 01)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
42MW107	16.00	2	6.00 - 16.00	10	737.81	0.75	737.06	5	47 D(VC)(May 01)	ND
42MW109									1 (VC)(Feb 01)	ND
Site 43										
43MW101R	16.00	2	6.00 - 16.00	10	721.20	4.90	716.30	4	NA ^{e/}	NA
43MW104	16.00	2	6.00 - 16.00	10	720.81	5.42	715.39	4	ND	1 J(benzene)(Nov 00)

a/ ft btoc = feet below top of casing.

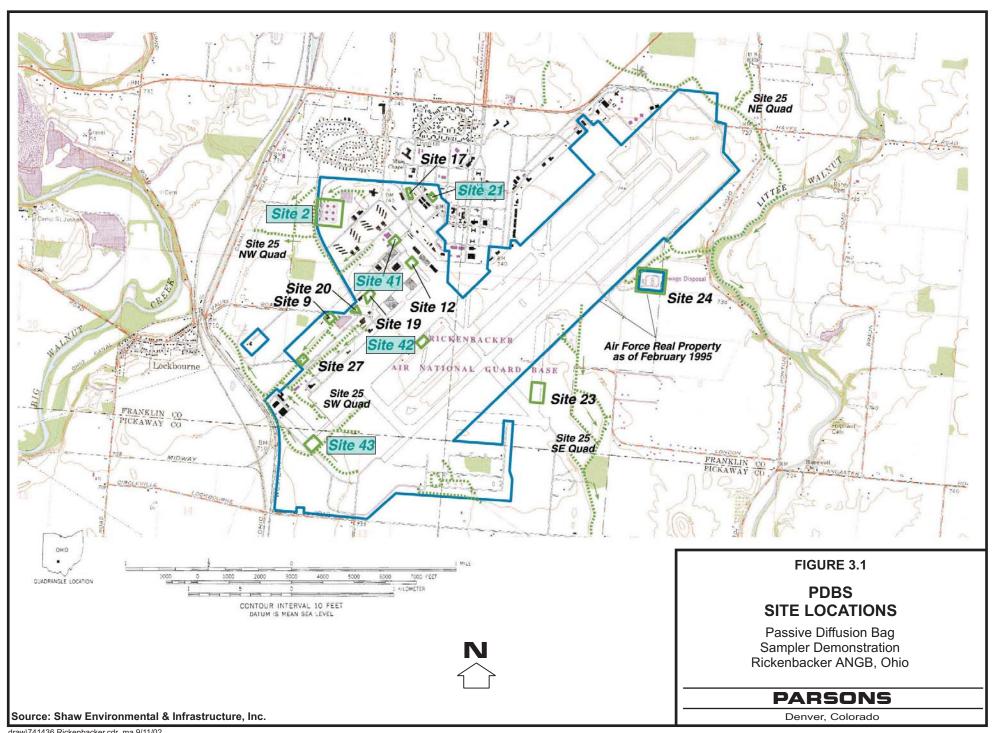
Rickenbacker Tables.xls -6-

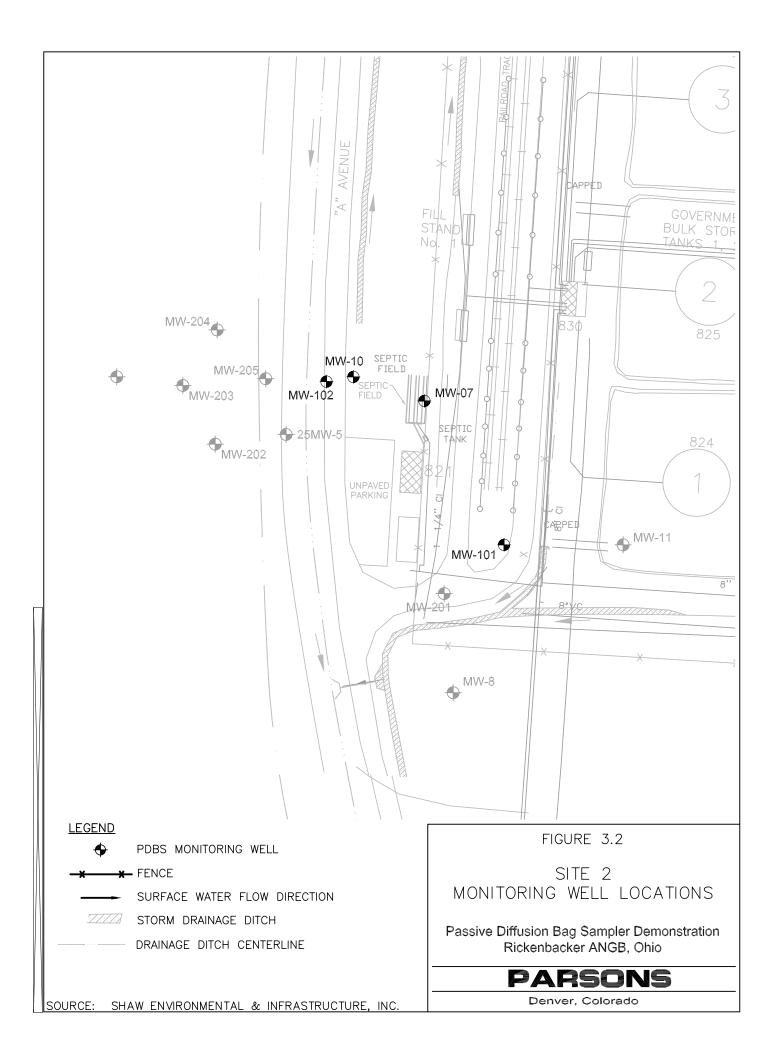
d/ CAHs = chlorinated aliphatic hydrocarbons.

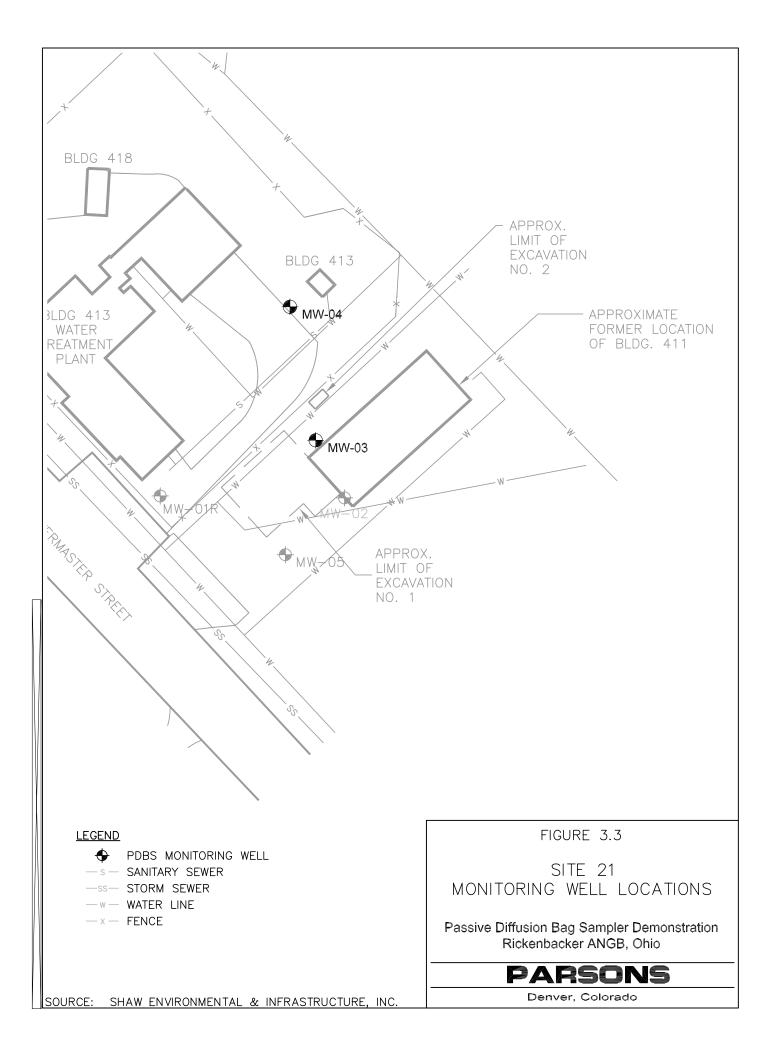
^{b/} ft amsl = feet above mean sea level.

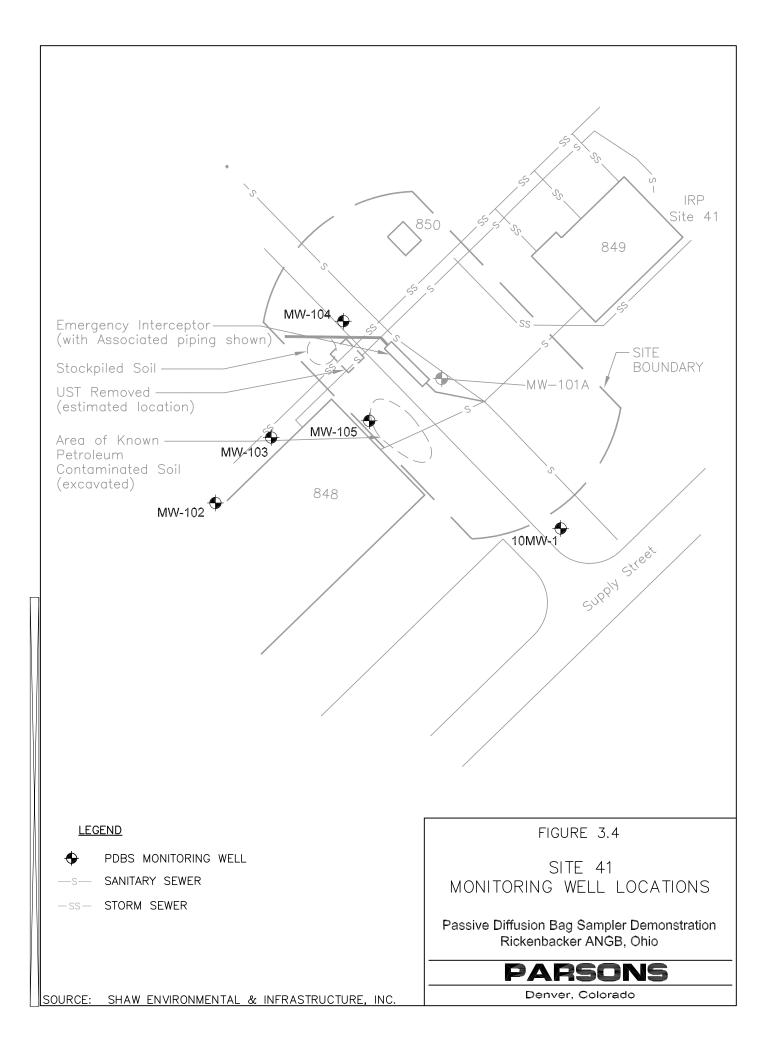
e/ ND = not detected; NA - not available.

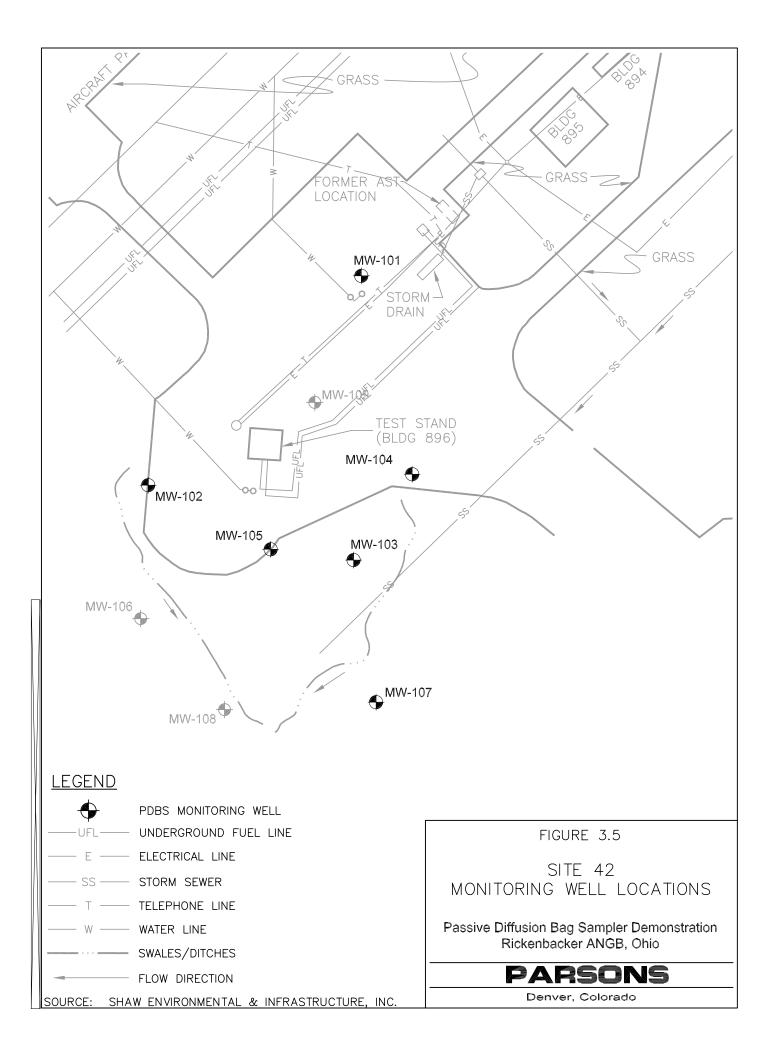
^{c/} COC = contaminant of concern; D = diluted result; J = estimated result; B = analyte detected in associated blank.

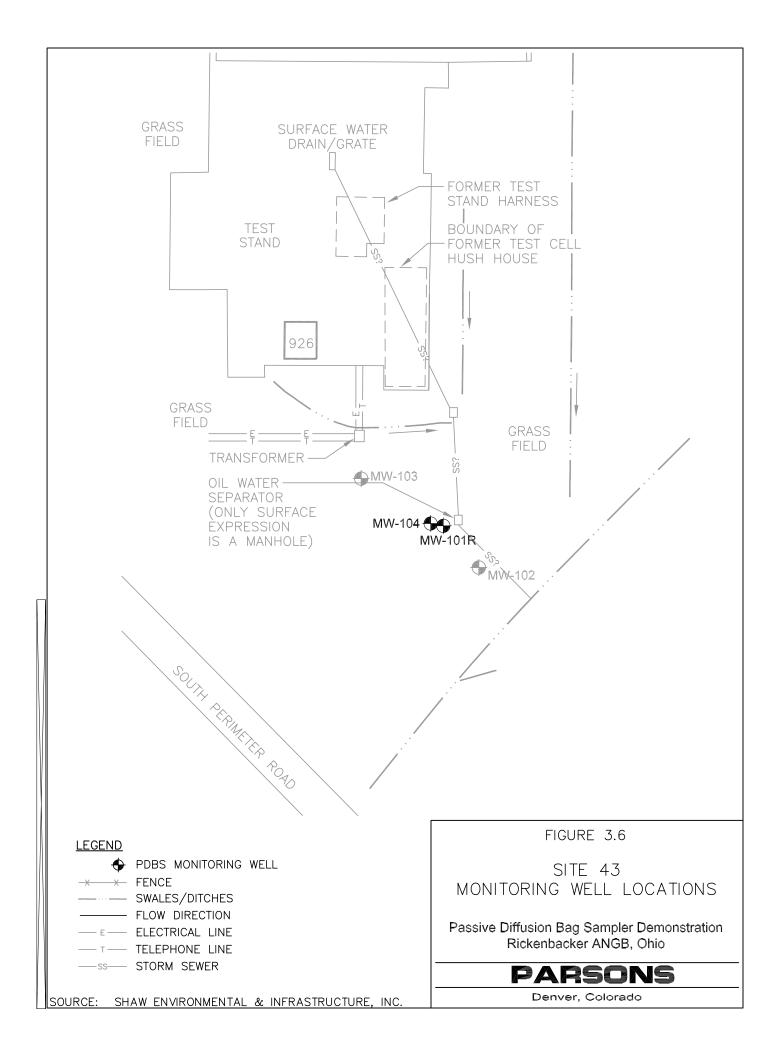












Shaw's Field Sampling Plan (IT, 2000) will be adopted as the site-specific Sampling and Analysis Plan (SAP) for the PDBS demonstration where appropriate. Appendix C from this SAP, which presents instructions for well gauging and inspection, groundwater level measurements, equipment decontamination, and waste handling proceedures, is contained in Appendix C of this work plan. In addition, the PDBS-specific methods and procedures outlined in the AFBCA Program SAP (Parsons, 2002) will be adhered to during all PDBS-related activities at RANGB.

3.2 Analytical Results Comparison/Evaluation

Analytical results for groundwater samples collected using PDBS and conventional techniques will be compared, and the results will be evaluated. Typically, if maximum concentrations from the PDBSs are higher than concentrations in samples collected using the conventional method, it is probable that the PDBS concentrations are more representative of ambient groundwater chemistry conditions than are the conventional-sampling data (Vroblesky, 2001). Considering this guidance, if the maximum analytical result obtained using PDB sampling is greater than or equal to the conventional sampling result, it will indicate that the PDBS method is appropriate for use in that particular well. If, however, the conventional method produces VOC results that are higher by a predetermined amount than the concentrations reported for the PDBSs, then the PDBS method may not adequately represent local ambient groundwater conditions. In this case, the difference may be due to a variety of factors, including hydraulic and chemical heterogeneity within the saturated screened interval of the well, vertical flow of groundwater within the well, and/or the relative permeability of the well screen with respect to the surrounding aquifer matrix (Vroblesky, 2001).

Analytical results for all samples collected using the diffusion samplers will be compared to results from the conventional sampling using relative-percent-difference (RPD), as defined by the following equation:

$$RPD = 100 \cdot [abs(D-C)]/[(D+C)/2]$$

Where:

abs = absolute value

D = diffusion sampler result

C = conventional sample result.

Therefore, multiple RPD values will be computed for each well that contained multiple PDBSs, despite the fact that there will be only one conventional sampling result. Each RPD value will be compared to the acceptance criteria to determine whether it is within the acceptable range.

For this investigation, an RPD of less than 30 will be considered to demonstrate good correlation between sample results. In summary, the PDBS acceptance criteria that will be used are:

- If at least one PDBS result for a given well is equal to or greater than the conventional sampling result, PDBS will be deemed appropriate for use in that well.
- If either the PDBS or the conventional sample result is greater than three times the laboratory reporting limit (RL), and the PDBS result is less than the conventional result, an RPD of 30 will be used as the acceptance criterion.
- If both the PDBS and conventional sample results are less than three times the laboratory RL, a value of ± the lowest RL will be used as the range of acceptance between the two values.

4.0 PROJECT ORGANIZATION

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John Hicks	Parsons PDBS Task Manager	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-1941 email: john.hicks@parsons.com	(303) 831-8208		
John Tunks	Parsons PDBS Deputy Task Manager	Parsons 1700 Broadway, Suite 900 Denver, Colorado 80290	(303) 764-8740 email: john.tunks@parsons.com	(303) 831-8208		

Name	Title	Address	Phone/Email	Fax
Shavonne Gordon	Parsons PDBS Site Manager for Rickenbacker ANGB	1 E. Campus View Blvd. Suite 230 Columbus, OH 43235	614-543-7050 email: shavonne.gordon@parsons.com	614-543-7080
Bradley P. Varhol	PDBS Vendor	EON Products, Inc. P.O. Box 390246 Snellville, GA 30039	(800) 474-2490 web site: www.eonpro.com email: sales@eonpro.com	(770) 978-8661
Mario Ierardi	AFBCA POC	HQ AFBCA 1700 Moore St. Rosyln, VA 22202	(703) 663-5518 email: mierardi@afbda1.hq.af.mil	(703) 663-8828
Paul McCarren	Shaw E & I Site Coordinator	Shaw E & I 11499 Chester Road Cincinnati, OH 45246-4012 (513) 782-4700 fax (513) 782-4807	(513) 782-4700 ext. 13 /4984 pmccarren@theitgroup.com	(513) 782-4749
Deb Fasio	Paragon Analytics, Inc. Laboratory Contact	Paragon Analytics Inc. 225 Commerce Drive Fort Collins, CO 80524	(800) 443-1511 (970) 490-1511 email:dfasio@paragonlabs.com	(970) 490-1522
Alan Friedstrom	AFBCA/DB Rickenbacker POC	AFBCA/DB Rickenbacker 7370 Minuteman Way Columbus, OH 43217-1161	(614) 492-8065 Ext. 13 email: afriedst@afbda1.hq.af.mil	(614) 492-8074
Joe Tyburski	Shaw E & I Project Manager	Shaw E & I 11499 Chester Road Cincinnati, OH 45246-4012 (513) 782-4700 fax (513) 782-4807	(513) 782-4970 jtyburski@theitgroup.com	(513) 782-4749

5.0 SCHEDULE

Work performed as part of this demonstration at RANGB will be completed according to the schedule summarized below.

- Submittal of the Draft Site-Specific PDBS Work Plan: 12 September 2002
- Receipt of Draft Site-Specific PDBS Work Plan Comments: 30 September 2002.
- Submittal of the Final Site-Specific PDBS Work Plan: 7 October 2002
- Install PDB samplers at the Rickenbacker ANGB: 8-10 October 2002
- Retrieve PDBS samplers at the Rickenbacker ANGB: 5-6 November 2002.
- Submittal of the Preliminary Internal Draft Site-Specific PDBS Report: April 2003.

6.0 REPORTING

The site-specific results report will provide a table identifying the location and depth for each PDBS collected. The analytical results collected by Parsons as part of this study will be compared to conventional-sampling analytical results collected by Shaw using the procedures described in Section 3.2. The results of the statistical comparisons will be clearly and logically presented in the site-specific results report. Comparison methods will include calculation of RPDs between PDBS and conventional sampling results. In

addition, the relative costs of PDB and conventional groundwater sampling will be compared.

The report will include a qualitative review of data sets when the correlation criteria for a well or compound are met in less than 70 percent of the comparisons. The purpose of this review will be to attempt to determine the most likely reason(s) for the lack of correlation. The arbitrary threshold value of 70 percent is not intended to indicate success or failure of PDBS, but rather to focus further review on those wells or analytes where a lower correlation was observed. If there are wells or compounds for which the correlation criteria were not as consistently met, and it's not clear that the poor correlation was due to a one-time, explainable occurrence (e.g., air bubbles in the sample vials for a particular sample), then the report will likely state that further evaluation of those wells/compounds should be performed before the PDBS method is used for those wells/compounds. The draft version of this report will be distributed according to the schedule shown in Section 5.0.

7.0 REFERENCES

- IT, 1998. Final Phase II Remedial Investigation Report, Rickenbacker Air National Guard Base, Columbus, Ohio. 30 January. Cincinnati, Ohio.
- IT, 1999. Remedial Action Decision Document for IRP Sites 2, 21, 41, 42, and 43. Rickenbacker Air National Guard Base, Columbus, Ohio. 13 October. Cincinnati, Ohio.
- IT, 2000. *Field Sampling Plan*, Environmental Cleanup Plan, Remedial Action for Sites 2, 21, 41, 42, and 43. Rickenbacker Air National Guard Base, Columbus, Ohio. September. Cincinnati, Ohio.
- IT, 2001. Final Quality Assurance Project Plan Remedial Action for Sites 2, 21, 41, 42, and 43. Rickenbacker Air National Guard Base, Columbus, Ohio. July. Cincinnati, Ohio.
- IT, 2002a. *Internal Draft Quarterly Monitoring Report for November 2001*, Remedial Action Operation for Sites 2, 21, 41, 42, and 43, Installation Restoration Program, Rickenbacker Air National Guard Base, Columbus, Ohio. May. Cincinnati, Ohio.
- IT, 2002b. *Technical Review CD,* Rickenbacker Air National Guard Base, Columbus, Ohio. 7 May. Cincinnati, Ohio.
- Parsons, 2002. Draft Work Plan for the Air Force Base Conversion Agency Passive Diffusion Sampler Demonstration. Prepared for the Air Force Center for Environmental Excellence, Technology Transfer Division, and the Air Force Base Conversion Agency. February. Denver, Colorado.
- Vroblesky, D.A., 2001. User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells. US Geological Survey Water-Resources Investigations Report 01-4060. Columbia, South Carolina.

APPENDIX A HEALTH AND SAFETY PLAN ADDENDUM

ADDENDUM TO THE PROGRAM HEALTH AND SAFETY PLAN FOR REMEDIAL PROCESS OPTIMIZATION SUPPORT AND DEMONSTRATION OF PASSIVE DIFFUSION BAG SAMPLING TECHNOLOGY AT SEVERAL DEPARTMENT OF DEFENSE INSTALLATIONS

 \mathbf{AT}

RICKENBACKER AIR NATIONAL GUARD BASE OHIO

August 2002

Prepared by:

PARSONS

1700 Broadway, Suite 900 Denver, Colorado 80290

Reviewed and Approved By:

Name

Date

Project Manager

Office Health and Safety (

Representative

Jan 18/29/02 8/29/02 Uniothy & Mustar Q, CIH 8/29/02

1.0 INTRODUCTION

This addendum modifies the existing Program Health and Safety Plan (HASP) entitled Program Health and Safety Plan for Remedial Process Optimization Support and Demonstration of Passive Diffusion Bag Sampling Technology at Several Department of Defense Installations (Parsons Engineering Science, Inc., [Parsons] 2002) for the evaluation of the use of passive diffusion bag samplers (PDBSs) in existing groundwater monitoring programs at selected U.S. Air Force (USAF) and other Department of Defense installations across the United States. This work is being performed under contract number F44650-99-D-005 Delivery Order DK01, for the U.S. Department of the Army, Corps of Engineers, Omaha District, and Air Force Base Conversion Agency (AFBCA), Roslyn, Virginia.

This addendum to the Program HASP was prepared to address the upcoming tasks at Rickenbacker Air National Guard Base (ANGB) in Ohio. Included or referenced in this addendum are the scope of services, site specific description and history, project team organization, hazard evaluation of physical hazards and of known or suspected chemicals, and emergency response information. All other applicable portions of the Program HASP remain in effect.

2.0 SCOPE OF SERVICES

Site activities will involve the placement of a water-filled diffusive membrane capsule in a well installation device at a specific depth in an existing groundwater monitoring well. The wells are located in various areas throughout the base. After a specified period of time, the water in the sampler is transferred to a sample container and submitted for laboratory analysis. No drilling or ground-intrusive activities are anticipated under the current scope of work.

3.0 SITE SPECIFIC DESCRIPTION HISTORY

The descriptions, history, and maps for the various sites are contained in the work plan entitled *Site-Specific Work Plan for the Passive Diffusion Bag Sampler Demonstration at Rickenbacker ANGB, Ohio* (Parsons, 2002).

4.0 PROJECT TEAM ORGANIZATION

The project team assigned to the PDBS demonstration activities at the former Rickenbacker ANGB is identified in the Program HASP. The following personnel also will be involved in this project.

Mr. Peter Guest Project Manager
Mr. John Hicks Task Manager
Ms. Shavonne Gordon Site Manager

Ms. Shavonne Gordon Site Health and Safety Officer

Mr. John Tunks or Mr. John Hicks
Mr. Alan Friedstrom

Alternate Site Health and Safety Officers
Rickenbacker ANGB Contact (ANGBCA)

5.0 HAZARD EVALUATION

5.1 Chemical Hazards

The primary contaminants of concern at the various sites include metals, benzene, acetone, ethylbenzene, and chlorinated compounds including trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride. Health hazard qualities for these and other compounds are presented in Table 5.1 at the end of this addendum. If other contaminants are found to exist at the site, this addendum will be modified to include the necessary information that will then be communicated to the onsite personnel.

5.2 Physical Hazards

Potential physical hazards at the former Rickenbacker ANGB include hazards associated with motor vehicles; slip, trip, and fall hazards; noise; and heat and/or cold exposure. These hazards are discussed in the Program HASP.

5.3 Biohazards

The following is in addition to the information presented in the Program HASP.

West Nile virus is spread by the bite of an infected mosquito, and can infect people, horses, many types of birds, and some other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. On rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The risk of severe disease is higher for persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

Human illness from West Nile virus is rare, even in areas where the virus has been reported. The chance that any one person is going to become ill from a mosquito bite is low. You can further reduce your chances of becoming ill by protecting yourself from mosquito bites. To avoid mosquito bites, apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors. When possible, wear long-sleeved clothes and long pants treated with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to exposed skin. If you spray your clothing, there is no need to spray repellent containing DEET on the skin under your clothing. Also, consider staying indoors at dawn, dusk, and in the early evening, which are peak mosquito biting times.

6.0 EMERGENCY RESPONSE PLAN

6.1 Emergency Contacts

In the event of any emergency situation or unplanned occurrence requiring assistance, the appropriate contacts should be made from the list below. A list of emergency contacts must be posted at the site.

<u>Contingency Contacts</u> <u>Telephone Number</u>

Site/Medical Emergency 911
Rickenbacker ANGB Fire Department 911

Ohio State Highway Patrol (513) 890-1111 Poison Control Center (800) 822-9761

AFBCA Contacts: Alan Friedstrom (614) 492-8065 Ext. 13

Medical Emergency: (Figure 6.1)

Hospital Name Mount Carmel East Hospital

Address 6001 East Broad Street, Columbus, OH 43213

Telephone Number 911 or (614) 686-6000 Ambulance 911 or (614) 492-4111

<u>Parsons Contacts</u> <u>Telephone Number</u>

Peter Guest (303) 831-8100 or 764-1919 (Work)

Project Manager

John Hicks (303) 831-8100 or 764-1941 (Work)

Task Manager (303) 279-3698 (Home)

Tim Mustard, CIH (303) 831-8100 or 764-8810 (Work)

Program Health and Safety Manager (303) 450-9778 (Home)
Ed Grunwald, CIH (678) 969-2394 (Work)
Corporate Health and Safety Manager (404) 299-9970 (Home)

Judy Blakemore (303) 831-8100 or 764-8861 (Work)

Assistant Program Health and Safety (303) 828-4028 (Home)

Manager (303) 817-9743 (Mobile)

Parsons 24-Hour Emergency Contact (866) 727-1411 (toll free)

Service (866) /2/-1411 (toll free

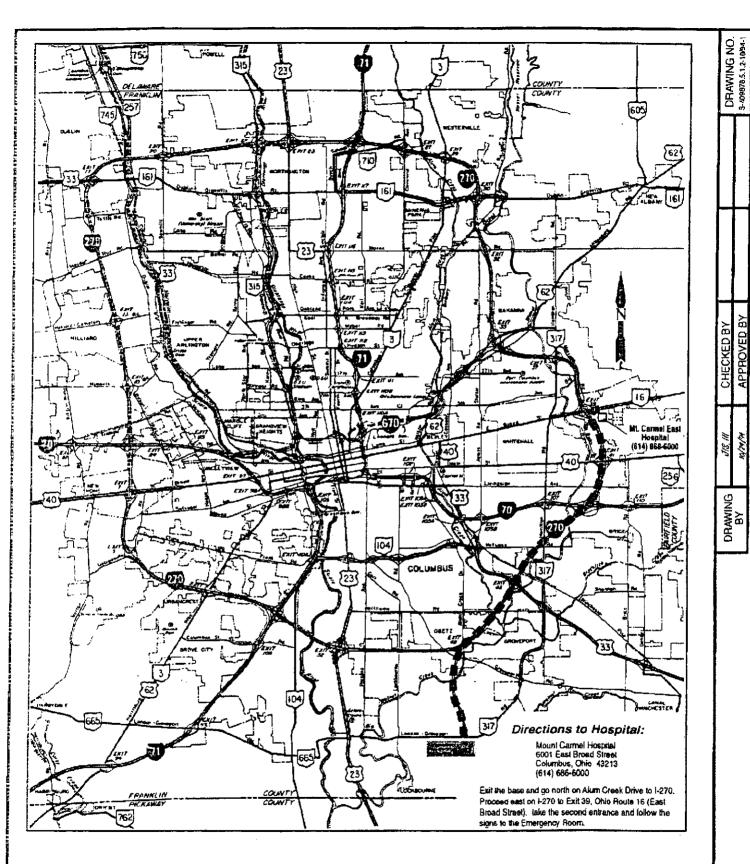




FIGURE 6.1
Directions to Mount Carmel Hospital.

7.0 LEVELS OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT REQUIRED FOR SITE ACTIVITIES

The personal protection level prescribed for field activities at the former Rickenbacker ANGB is Occupational Safety and Health Administration (OSHA) Level D with a contingency for the use of OSHA Level C or B, as site conditions require. The following will be used to select respiratory protection at each of the sites.

If sustained air-monitoring readings in the worker-breathing zone indicate vapor concentrations greater than background for 30 seconds or longer, the field crew will be forced to evacuate and ventilate the area until readings are less than 1 part per million (ppm) in the worker-breathing zone. If ventilation is inadequate, air samples will be taken to confirm or deny the existence of the contaminants of concern and/or the crew will upgrade to Level B respiratory protection. These air samples will be sent to a lab to be analyzed by US Environmental Protection Agency (USEPA) Compendium Method TO-14 or the equivalent. Decisions for further actions and for levels of respiratory protection will be made after consulting with the project manager and program health and safety manager.

Section 7 of the Program HASP contains guidelines for selection of personal protective equipment (PPE). PPE will be required when handling contaminated samples and when working with potentially contaminated materials. See page 7-4 of the Program HASP for PPE to be used.

8.0 FREQUENCY AND TYPES OF AIR MONITORING

A photoionization detector (PID) with an 10.2 electron volts (eV) (HNU[®]) or equivalent lamp will be used for air monitoring during this project since the ionization potentials of the contaminants of concern are below 10.2 eV.

TABLE 5.1 HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN

Compound	PEL ^{a/} (ppm)	TLV b/ (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	Physical Description/Health Effects/Symptoms
Acetone	750	500	2,500 (10% LEL) ^{f/}	100	9.69	Colorless liquid with mint-like odor. Irritates nose, eyes, and throat. Causes headaches, dizziness, central nervous system (CNS) depression, and dermatitis.
Arsenic (Inorganic, as As)	0.01 mg/m ^{3 g/} (29 CFR 1910.1018) h/	0.01 mg/m ³	5 mg/m ³	NA ^{i/}	NA	Silver-gray or tin-white, brittle, odorless solid. Causes ulceration of the nasal septum, dermatitis, gastrointestinal disturbances, nervous system degeneration, respiratory irritation, skin spots, and lung and lymphatic cancer. Mutagen, experimental teratogen, and carcinogen.
Benzene	1 (29 CFR 1910.1028) h/	0.5 (skin) ^{j/}	500	4.7	9.24	Colorless to light-yellow liquid (solid<42F) with an aromatic odor. Eye, nose, skin, and respiratory system irritant. Causes giddiness, headaches, nausea, staggered gait, fatigue, anorexia, exhaustion, dermatitis, bone marrow depression, and leukemia. Mutagen, experimental teratogen, and carcinogen.
1,2-Dibromo-3-chloropropane (Nemagon, DBCP)	0.001 (29 CFR 1910.1044) h/	NA	NA	0.1-0.03 mg/m ³	NA	Dense, yellow or amber, liquid (solid<43°F) pesticide with a pungent odor at high concentrations. Irritates eyes, nose, skin, and throat. Causes drowsiness, nausea, vomiting, pulmonary edema, liver and kidney injury, and male sterility. Also affects spleen. In animals, causes cancer of the nasal cavity, tongue, pharynx, lungs, stomach, and adrenal and mammary glands. Mutagen, teratogen, and carcinogen.
1,2-Dichloroethene (DCE) (cis- and trans-isomers)	200	200	1,000	0.085-500	9.65	Colorless liquid (usually a mixture of cis- and trans- isomers), with ϵ slightly acrid, chloroform-like odor. Irritates eyes and respirator system. CNS depressant. Cis- isomer is a mutagen.
Ethylbenzene	100	100	800 (10% LEL)	0.25-200	8.76	Colorless liquid with an aromatic odor. Irritates eyes, skin, and mucous membranes. Causes dermatitis, headaches, narcosis, and coma. Mutagen and experimental teratogen.
Thallium (soluble compounds as TI)	0.1 mg/m ³ (skin)	0.1 mg/m ³ (skin)	15 mg/m ³	NA	NA	Metal is bluish-white, soft, and malleable. Appearance and properties vary with specific compound. Used as a rodenticide and fungicide. Causes nausea, diarrhea, abdominal pain, vomiting, drooping of upper eyelids, strabismus ^{y/} , degeneration of the nervous system, tremors, chest tightness behind the sternum, chest pain, pulmonary edema, seizures, spasms of the face and extremities, psychosis, liver and kidney damage, hair loss, and tingling skin on the legs.

6

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TABLE 5.1 HEALTH HAZARD QUALITIES OF HAZARDOUS SUBSTANCES OF CONCERN

Compound	PEL ^{a/} (ppm)	TLV ^{b/} (ppm)	IDLH ^{c/} (ppm)	Odor Threshold ^{d/} (ppm)	Ionization Potential ^{e/} (eV)	,
Toluene	100	50 (skin)	500	0.2-40 k/	8.82	Colorless liquid with sweet, pungent, benzene-like odor. Irritates eyes and nose. Causes fatigue, weakness, dizziness, headaches, hallucinations or distorted perceptions, confusion, euphoria, dilated pupils, nervousness, tearing, muscle fatigue, insomnia, skin tingling, dermatitis, bone marrow changes, and liver and kidney damage. Mutagen and experimental teratogen.
Trichloroethene (TCE)	50	50	1,000	21.4-400	9.45	Clear, colorless or blue liquid with chloroform-like odor. Irritates skin and eyes. Causes fatigue, giddiness, headaches, vertigo, visual disturbances, tremors, nausea, vomiting, drowsiness, dermatitis, skin tingling, cardiac arrhythmia, and liver injury. In animals, causes liver and kidney cancer. Mutagen, experimental teratogen, and carcinogen
Vinyl Chloride	1 (29 CFR 1910.1017) h/	1	NA	260	9.99	Colorless gas (liquid<7°F) with a pleasant odor at high concentrations Severe irritant to skin, eyes, and mucous membranes. Causes weakness, abdominal pain, gastrointestinal bleeding, enlarged liver pallor or blue skin on the extremities, liver cancer, and frostbite (liquid). Also attacks lymphatic system. Mutagen, experimental teratogen, and carcinogen.

a/ PEL = Permissible Exposure Limit. OSHA-enforced average air concentration to which a worker may be exposed for an 8-hour workday without harm Expressed as parts per million (ppm) unless noted otherwise. PELs are published in the NIOSH Pocket Guide to Chemical Hazards, 1997. Some states (such as California) may have more restrictive PELs. Check state regulations.

b/ TLV = Threshold Limit Value - Time-Weighted Average. Average air concentration (same definition as PEL, above) recommended by the America Conference of Governmental Industrial Hygienists (ACGIH), 2001 TVLs® and BEIs®.

c/ IDLH = Immediately Dangerous to Life or Health. Air concentration at which an unprotected worker can escape without debilitating injury or healt effects. Expressed as ppm unless noted otherwise. IDLH values are published in the NIOSH Pocket Guide to Chemical Hazards, 1997.

d/ When a range is given, use the highest concentration.

e/ Ionization Potential, measured in electron volts (eV), used to determine if field air monitoring equipment can detect substance. Values are published in the NIOSH Pocket Guide to Chemical Hazards. June 1997.

f/ Indicates that the IDLH value was based on 10% of the lower explosive limit for safety considerations, even though relevan toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations (NIOSH Pocket Guide to Chemical Hazards, 1997).

 $g/mg/m^3 = milligrams per cubic meter.$

h/ Refer to expanded rules for this compound.

i/ NA = Not available.

j/ (skin) = Refers to the potential contribution to the overall exposure by the cutaneous route

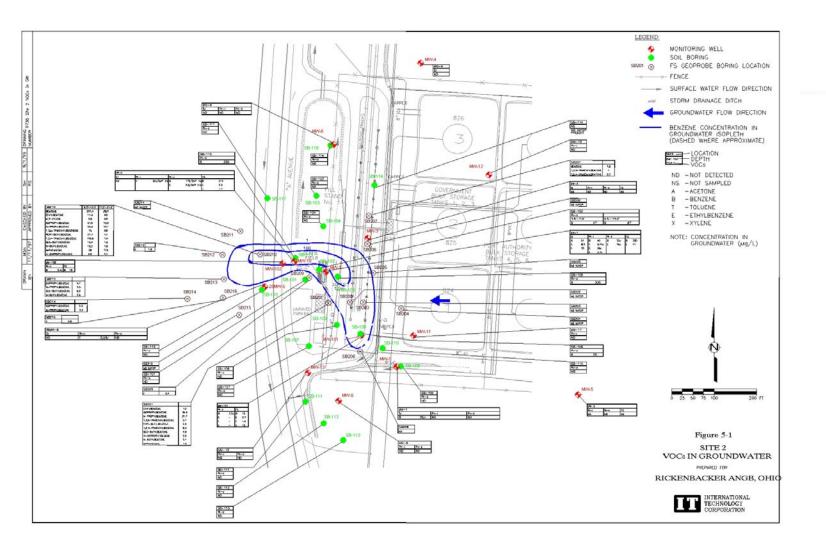
k/ Olfactory fatigue has been reported for the compound and odor may not serve as an adequate warning property

APPENDIX B HISTORIC SITE DATA

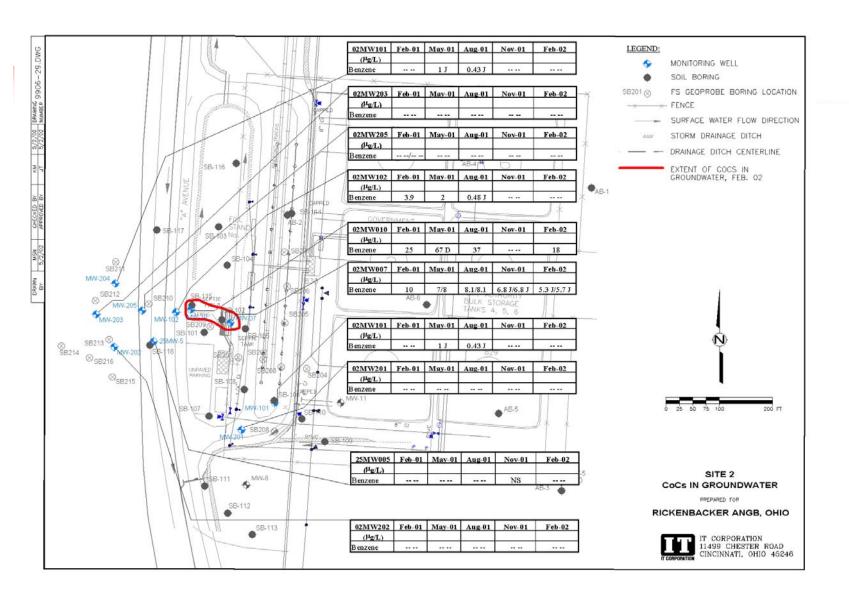
Site 2

- COC Benzene
- Selected Remedy:
 - Institutional Controls
 - Natural Attenuation
 - Groundwater Cutoff Trench with Reactive Wall

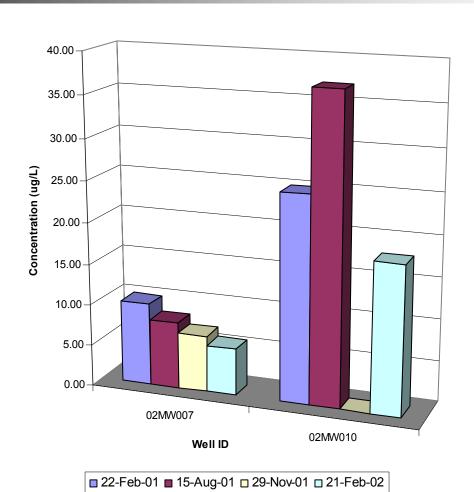
Site 2 – Plume in 1999



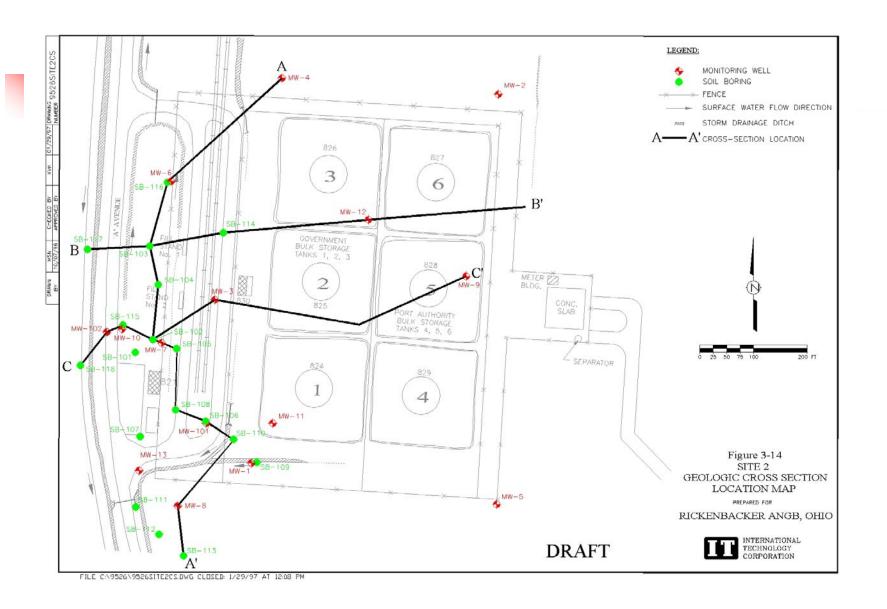
Site 2 – Plume in 2002



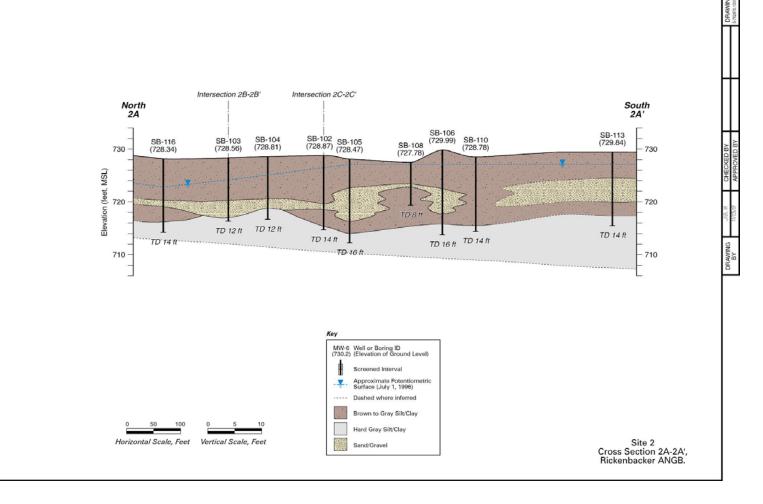
MW-7, MW-10 - Benzene



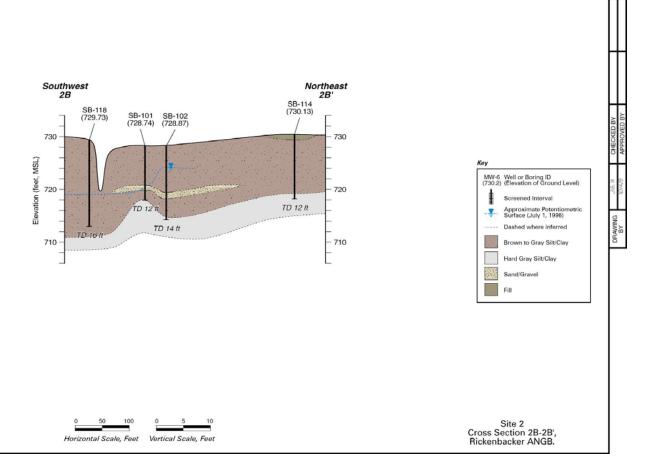
Site 2 - Cross Section Location Map



Site 2 - Cross Section



Site 2 - Cross Section



Summary – Site 2

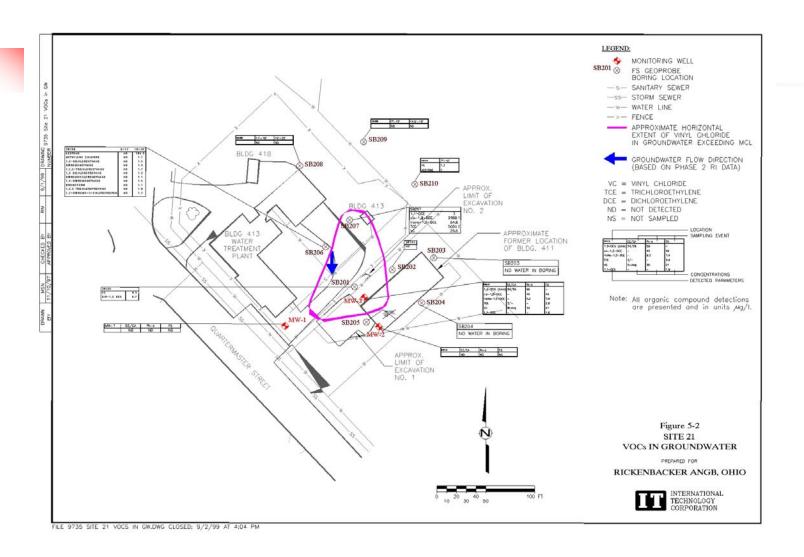
- Benzene concentrations have significantly decreased (from 210 μg/L to 18 μg/L) but remain above action levels in two upgradient wells.
- Benzene plume downgradient of reactive wall has not increased. Sentry wells continue to show non-detect.
- Reactive wall operation and monitoring should continue.



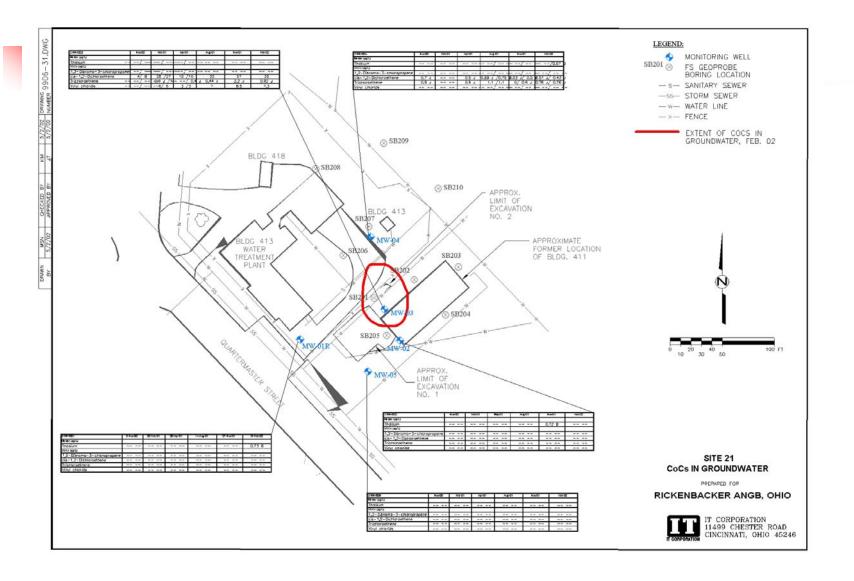
Summary – Site 21

- TCE and cis-1,2-DCE concentrations have significantly decreased from 5,050 µg/L to below action levels.
- Vinyl Chloride remains above action level (2 μg/L).
- Monitoring should continue and natural attenutation evaluation should be performed.

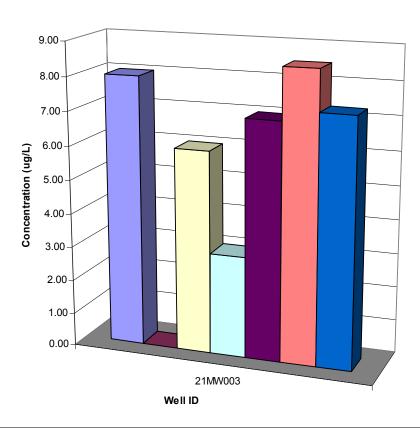
Site 21 – Plume in 1999



Site 21 – Plume in 2002

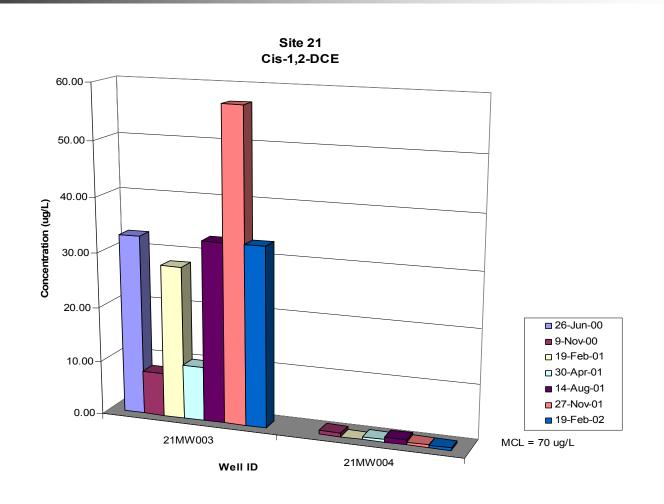


MW-3 – Vinyl Chloride





MW-3 and MW-4 Cis-DCE





Summary – Site 21

- TCE and cis-1,2-DCE concentrations have significantly decreased from 5,050 µg/L to below action levels.
- Vinyl Chloride remains above action level (2 μg/L).
- Monitoring should continue and natural attenutation evaluation should be performed.

Site 41

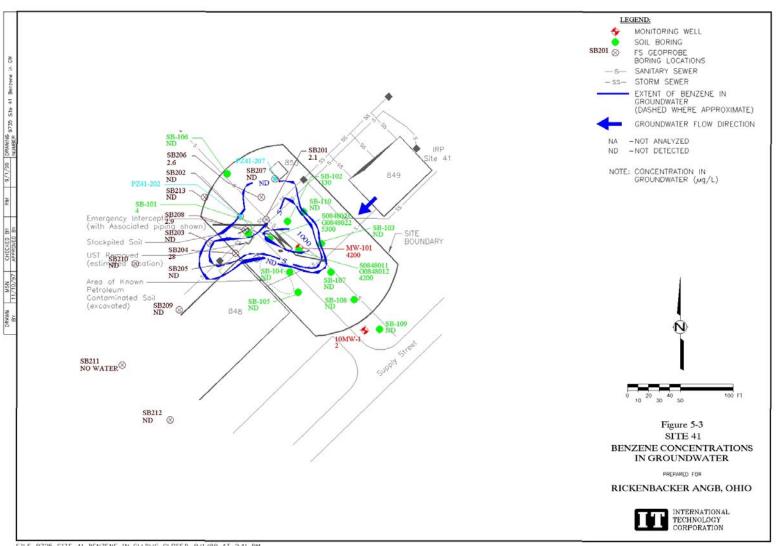
COCs:

- Acetone
- Benzene, Toluene, Ethylbenzene
- cis-1,2-dichloroethene, Total 1,2-DCE, Trichloroethene, Vinyl Chloride
- Thallium

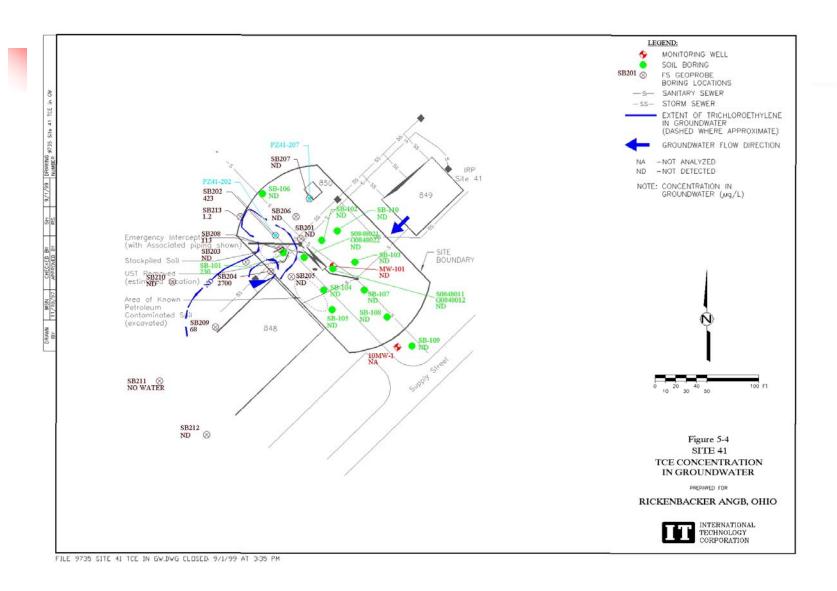
Selected Remedy:

- Institutional Controls
- Oil/Water Separator Removal
- Free Product Removal
- Hot Spot Removal
- Natural Attenuation

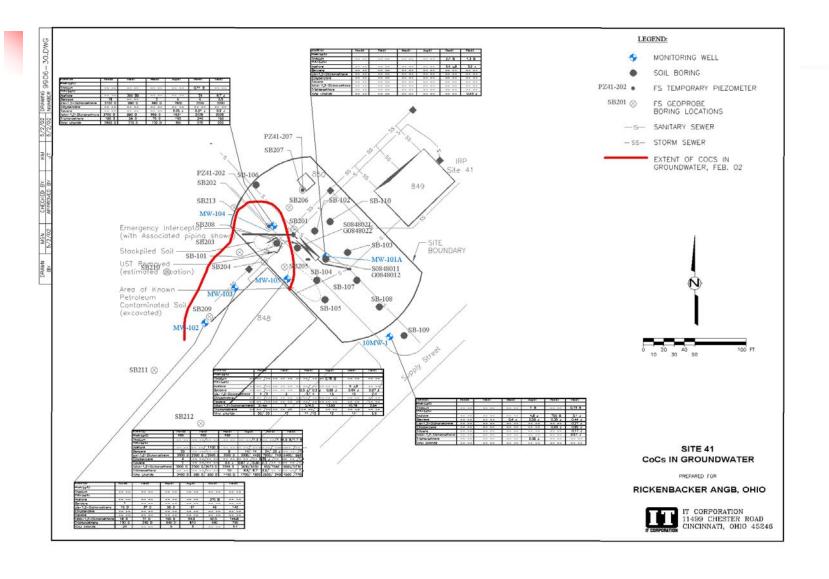
Site 41 – Benzene Plume in 1999



Site 41 – TCE Plume in 1999



Site 41 – VOC Plume in 2002

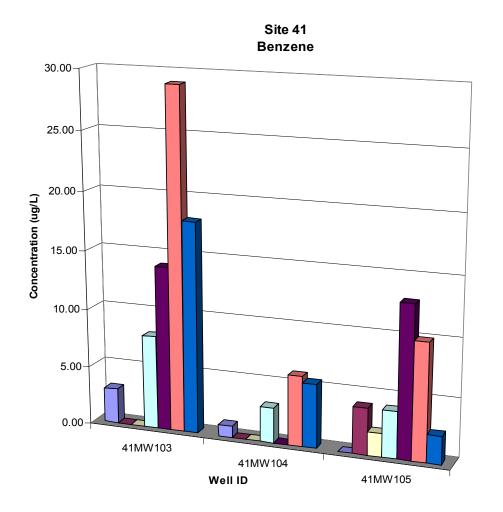


MW-103, MW-104, MW-105 – Benzene

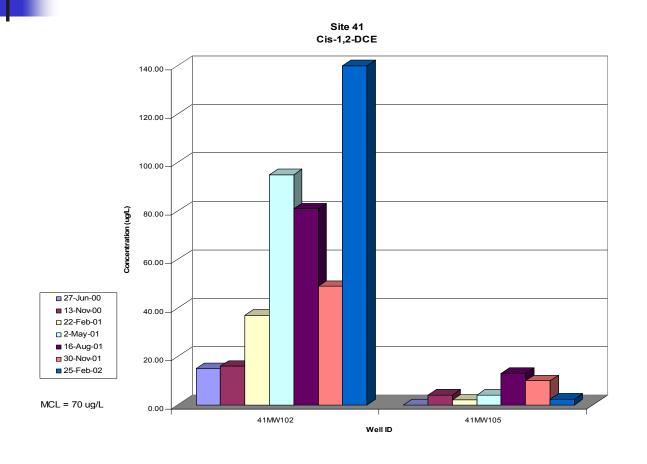
■ 27-Jun-00 ■ 13-Nov-00

□ 22-Feb-01□ 2-May-01■ 16-Aug-01

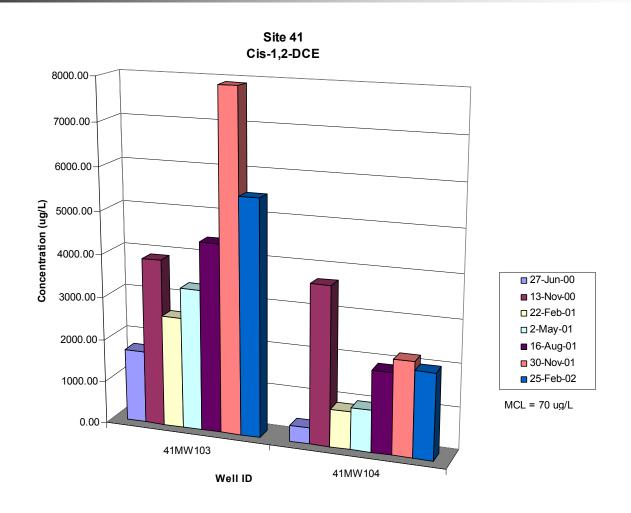
30-Nov-01 25-Feb-02 MCL = 5 ug/L



MW-102, MW-105 - Cis-1,2-DCE

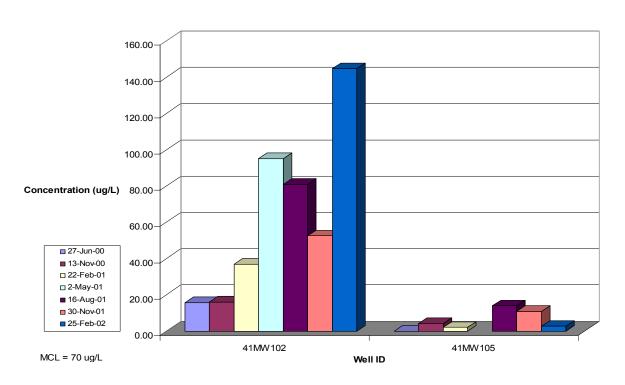


MW-103, MW-104 - Cis-1,2-DCE

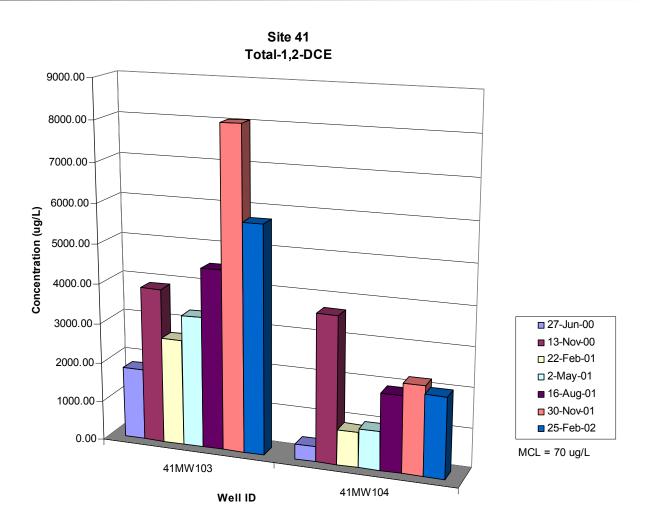


MW-102, MW-105 - Total 1,2-DCE

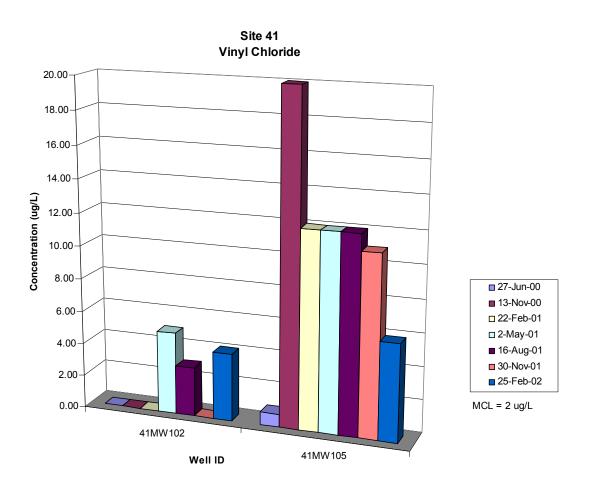




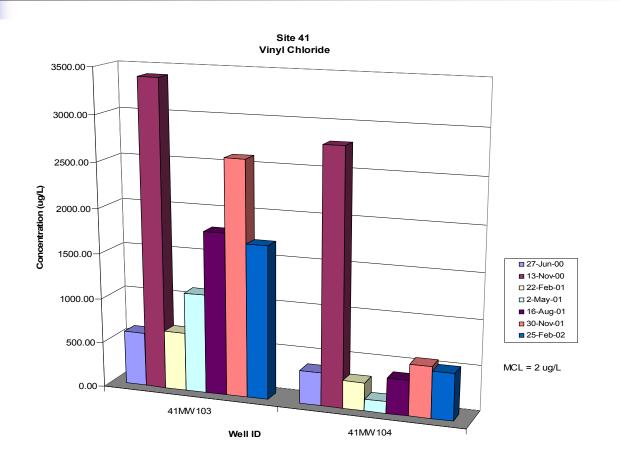
MW-103, MW-104 – Total 1,2-DCE



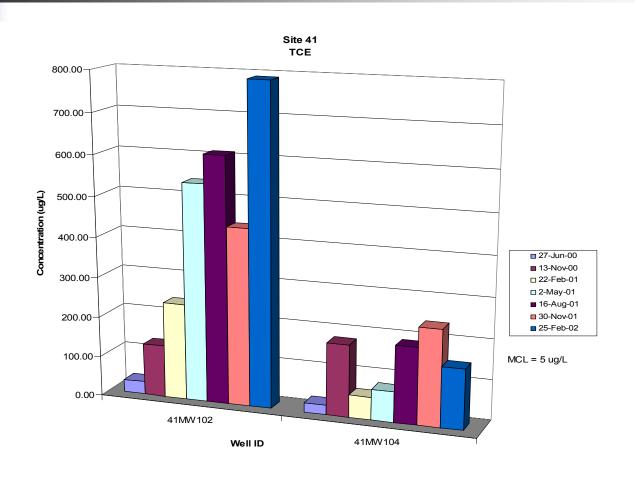
MW-102, MW-105 – Vinyl Chloride



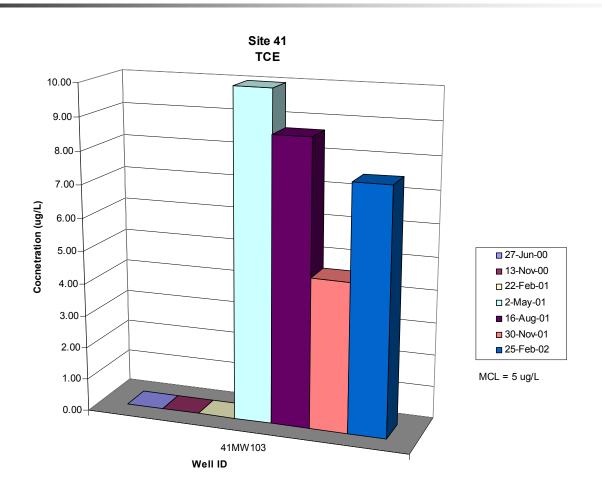
MW-103, MW-104 – Vinyl Chloride



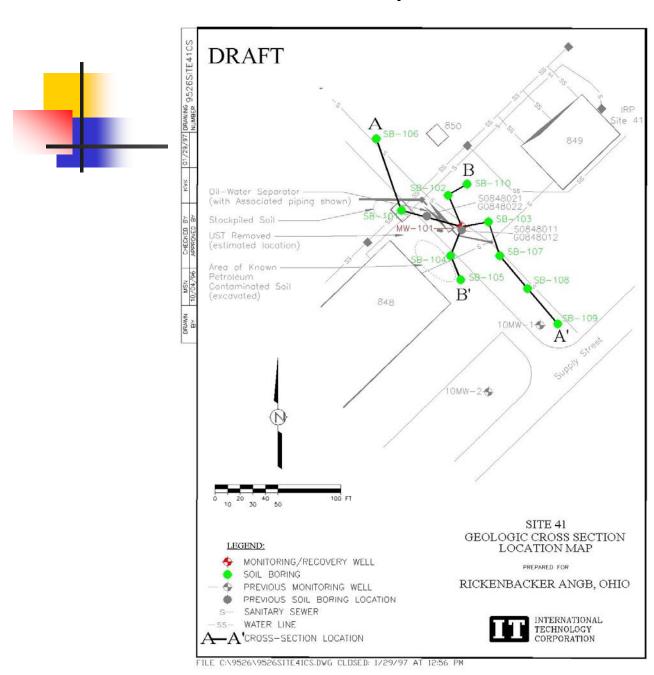
MW-102, MW-104 – TCE



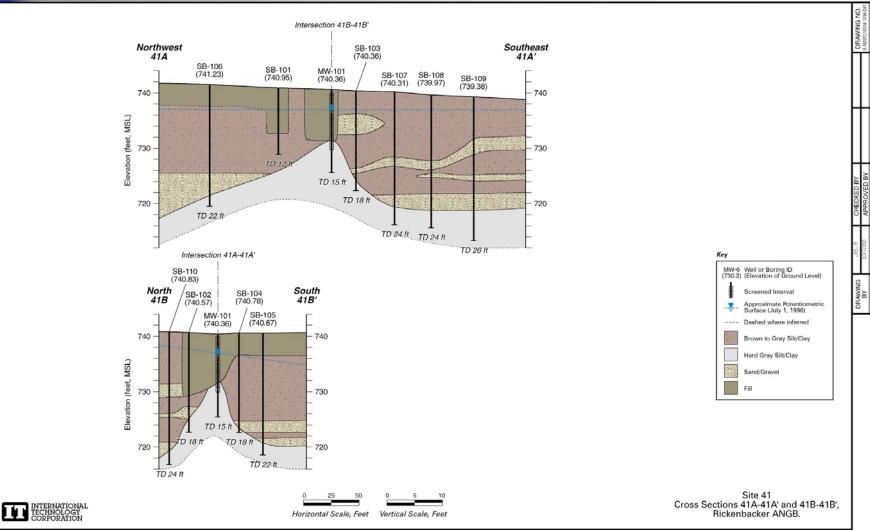
MW-103 - TCE



Site 41 - Cross Location Map



Site 41 - Cross Sections





- Significant contamination of chlorinated organics remains at the site.
- Benzene concentrations have decreased.
- Additional remedial actions may be necessary.
- Monitoring should continue and natural attenuation evaluation should be performed.

Site 42

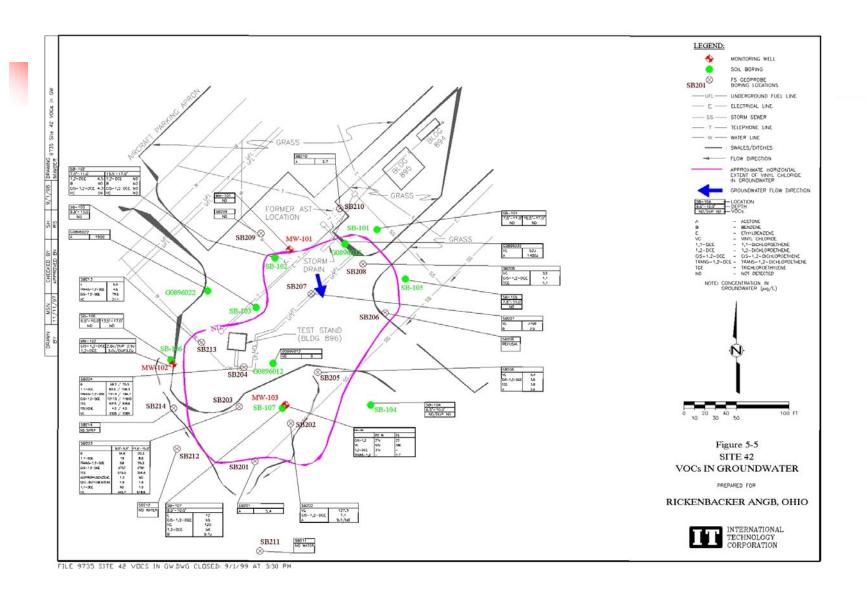
COCs:

- Benzene
- cis-1,2-dichloroethene
- Trichloroethene
- Vinyl Chloride
- Arsenic

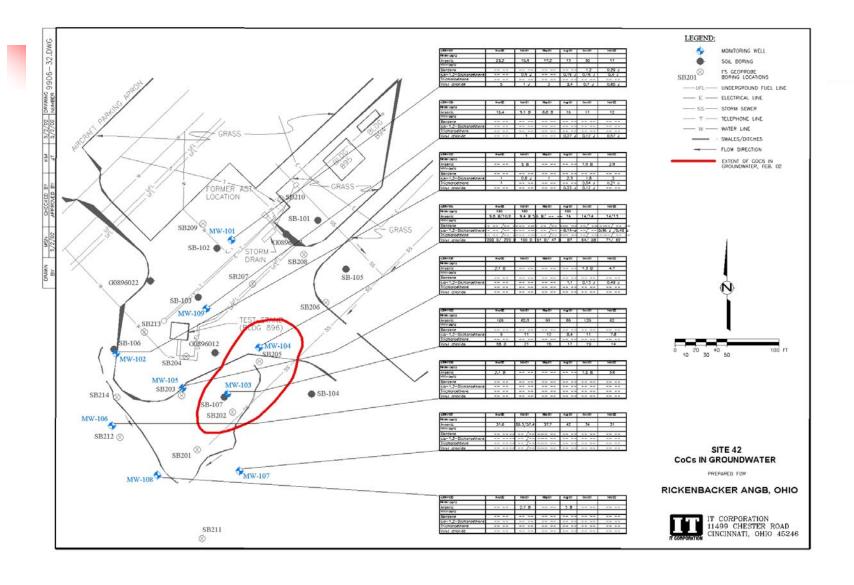
Selected Remedy:

- Institutional Controls
- Hot Spot Removal
- Natural Attenuation

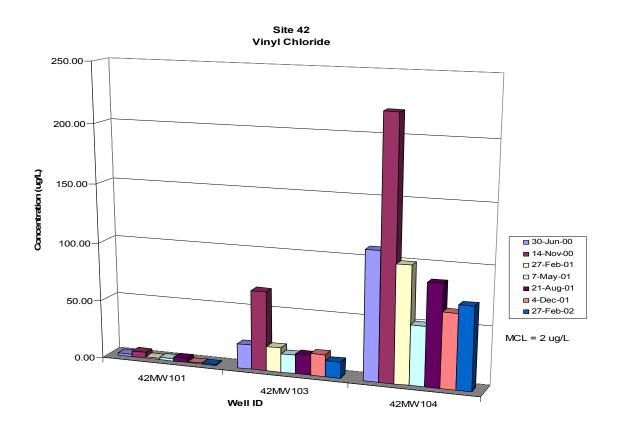
Site 42 – Plume in 1999



Site 42 – Plume in 2002



MW-101, MW-103, MW-104 - Vinyl Chloride





Summary – Site 42

- Benzene and TCE concentrations have significantly decreased to below action levels.
- Vinyl Chloride remains above action level (2 μg/L).
- Arsenic remains above action level in MW-103.
- Monitoring should continue and natural attenuation evaluation should be performed.

Site 43

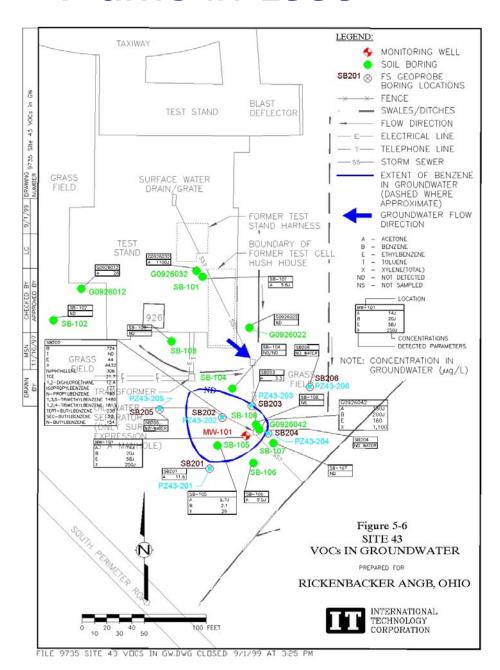
COCs:

- Benzene
- 1,2-dichloroethene
- Trichloroethene
- Thallium

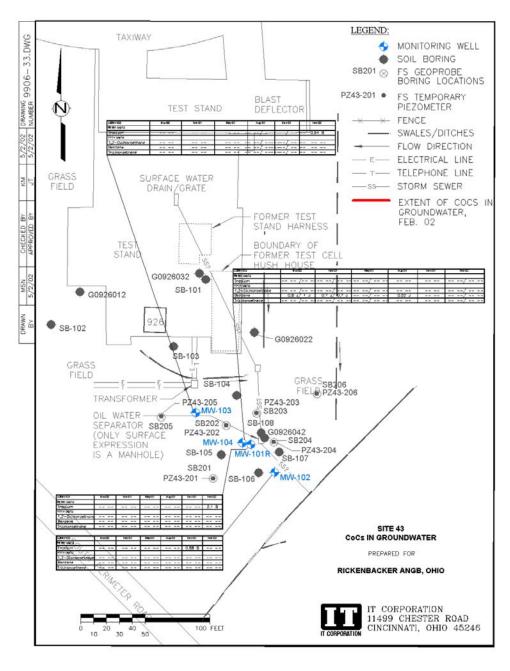
Selected Remedy:

- Institutional Controls
- Removal of the Oil/Water Separator
- Natural Attenuation

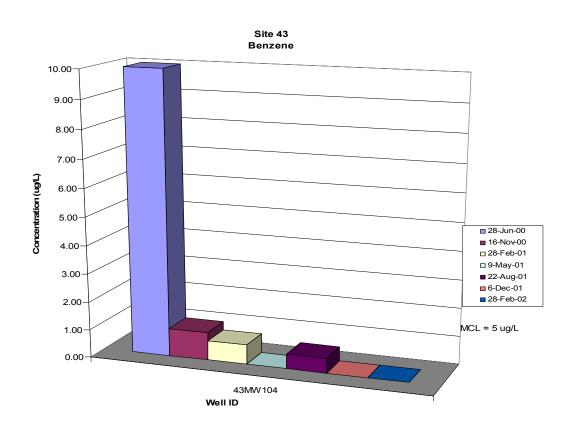
Site 43 – Plume in 1999



Site 43 – Plume in 2002



MW-104 - Benzene





- VOC concentrations have significantly decreased to below action levels.
- Monitoring should continue and natural attenuation evaluation should be performed.

APPENDIX C SAMPLING AND ANALYSIS PLAN FIELD PROCEEDURES

FIELD SAMPLING PLAN

This addendum to the Environmental Cleanup Plan (ECP), Remedial Action for Sites 2, 21, 41, 42, and 43 for the Rickenbacker Air National Guard Base (RANGB) (Figure 1). Environmental Quality Management (EQM) (May, 2000) has been prepared by IT Corporation (IT) as part of the requirements of U.S. Air Force Human Systems Center, Contract No. F41624-97-D-8024, Delivery Order (DO) 0019. DO 0019 covers activities associated with remedial action operation (RA-O) for Installation Restoration Program (IRP) sites 1, 2, 21, 41, 42, and 43, RA-O for Site 2 (Figure 2). This addendum presents and summarizes the technical approaches to be used during the quarterly (for up to two years) groundwater RA-O activities at sites 2, 21, 41, 42, and 43.

RA-O activities include sampling of groundwater monitoring wells and investigation derived waste (IDW) handling. The Field Sampling Plan (FSP) describes in detail the proposed sampling and analysis program, specific field procedures, field measurements, and record keeping requirements for the field effort. RA-O activities will be conducted in accordance with the Air Force Center for Environmental Excellence (AFCEE) Model Field Sampling Plan (MFSP). Version 1.1. Procedures for conducting the field investigation are detailed in the following sections.

1.0 Field Operations

This section describes the overall project field logistics and activities necessary to complete the project sampling objectives described in the ECP. All fieldwork will be conducted in accordance with the site specific Health and Safety Plan (HSP).

1.1 Site Reconnaissance, Preparation, and Restoration

RA-O data collection activities will be performed throughout the Base property. The field office and the primary staging area for field equipment and supplies will be located in Building 441. Equipment decontamination will be performed at a suitable area, centrally located, determined by the AFCEE Field Engineer.

Since sampling sites will be spread across the base, one specific controlled work area will not be established. The IT Field Coordinator will notify the Base Point of Contact (POC) of upcoming

the waste in accordance with RCRA, TSCA and DOT regulations. The waste will then be profiled into appropriate treatment/disposal facilities approved by the Base representative. In certain circumstances, if a waste is found to be hazardous, further testing may be required to meet land disposal restriction requirements for the underlying hazardous constituents (UHCs) listed in 40CFR 268.40. This will be determined on a site by site basis, and is dependent on the amount of available history for a given site. This however, will not change the accumulation time for the waste, which began when the waste was determined to be hazardous. Information on UHCs must be determined prior to shipping the material off-site for treatment or disposal.

2.0 Groundwater Sampling

During RA-O activities groundwater samples will be collected from groundwater monitoring wells at IRP sites 2, 21, 41, 42, and 43. Thirty-four monitoring wells will be sampled during quarterly RA-O activities. Table 1 presents a summary of monitoring well construction details. The total number of wells to be sampled at each site is as follows:

- Site 2 10 wells (Figure 3)
- Site 21 5 wells (Figure 4)
- Site 41 6 wells (Figure 5)
- Site 42 9 wells (Figure 6)
- Site 43 4 wells (Figure 7)

Groundwater samples collected during RA-O activities will be sampled for: Volatile Organic Compounds (VOCs), Natural Attenuation Parameters, Arsenic, and Manganese. At Sites 21, 41, and 43 Thallium will also be analyzed (IT, Remedial Action Decision Document, October 13, 1999) Table 2 presents a summary of analytical parameters and number of samples to be collected per site.

2.1 Groundwater Level Measurements

One complete round of groundwater level measurements, at each site, will be collected prior to initiation of groundwater sampling activities. Groundwater levels will be measured from each well within a single 24-hour period. Groundwater levels will also be measured prior to sampling at each well location. A water level indicator will be used to measure water level to the nearest 0.01 foot. The water level indicator will be decontaminated between each location in accordance

with the specifications documented in Section 4.0. A groundwater elevation log will be completed for each round of groundwater measurements (Appendix B).

If a well casing cap is airtight prior to the removal of the cap, the well will be allowed to equilibrate to atmospheric pressure for several minutes. In this case, a series of water level readings, separated by a minimum of 5 minutes, will be conducted to assure equilibration to +/- 0.01 feet.

2.2 Groundwater Purging and Sampling Procedures

Purging and sampling of groundwater monitoring wells will be conducted using micropurge techniques. Micropurging is defined as a low-flow rate purging and sampling method that induces laminar flow in the immediate vicinity of the sampling pump intake, thus drawing groundwater directly from the sampled aquifer, horizontally through the well screen, and into the sampling device. Purging and sampling of the monitoring wells will be conducted in accordance with AFCEE MFSP Section 6.1.1.1.2.

Potential vapors in wells will be monitored at the well head upon removing the well cap. Screening will be performed using a calibrated photoionization detector (PID) held at the open wellhead for measurement. In addition, the breathing zone will be monitored for potential organic vapor exposures to the sampling personnel. This information will be recorded in the sampling log used to determine levels of protection in accordance with the HSP.

Purging and sampling of monitoring wells will be performed using a peristaltic pump and disposable tubing. Disposable, medical-grade silicon tubing will be attached to the pump drive-head. Disposable, Teflon[®] lined polyethylene tubing will be attached to the silicon tubing and will be used for the transference of groundwater from the well. The tubing will be slowly lowered to approximately 1 foot from the well bottom. A water level indicator will then be lowered to the top of water. Once the tubing and water level indicator are in-place, the peristaltic pump will be turned on at its lowest pumping rate. The water level in the well will be monitored as the pumping rate of the peristaltic pump is increased. The pumping rate will be increased until a measurable lowering of the water level is observed, or until 2.0 liters/minute flow is reached, whichever occurs first. The pumping rate will be set at that rate. Pumping rates will be measured using a graduated container (i.e., plastic bucket) prior to containerization. The field

parameters of temperature, pH, electrical conductivity, and turbidity of the purge water will be measured and recorded in the field logbook and the purge log every five minutes during purging.

The sample will be collected after the stabilization of the measured field parameters is achieved. Stabilization is defined as follows:

- Temperature ± 1°C
- pH \pm 0.1 units
- electrical conductivity ± 5%
- turbidity 25 NTU or ± 10 NTU for at least 30 minutes

If field parameters do not stabilize, the sample shall be collected after three well volumes have been removed, and the anomalous parameters shall be brought to the Site Coordinators attention. If a well is purged dry before field parameter stabilization or three well bore volumes have been removed, then sampling will be conducted as soon as the water level has recovered to 80 % of its static level or 24 hours after completion of purging, which ever comes first.

The well volume is defined as the volume of submerged casing, screen, and filter pack, minus the estimated volume of the sand in the filter pack. The well volume calculation will be carried out by using the following formula:

$$V_c = \pi (di/2)^2 (TD-H)$$
 $V_f = \pi [dH/2)^2 - (do/2)^2] (TD-S \text{ or } H) (P)$

If S>H use S, if SV_t = (V_c + V_f)(7.48)

Where:

Vc = Volume of water in casing, ft³
Vf = Volume of water in filter pack, ft³
Vt = Total volume, gallon
di = inside diameter of casing, ft
do = outside of diameter of casing, ft
dH = diameter borehole, ft
TD = Total depth of well, ft

H = Depth to water, ft, from ground surface

S = Depth to base of bentonite seal, ft, from ground surface

P = estimated porosity of filter pack (typical range of 30 to 35%)

Groundwater samples will be collected directly from the disposable Teflon lined polyethylene tubing. Samples will be collected in the following order: VOCs, Natural Attenuation Parameters, and metals (arsenic, manganese, and thallium). When collecting VOC samples, the pumping rate will be lowered to minimize turbulence and aeration of the sample. VOA bottles will be filled until a positive meniscus is achieved above the rim of the sample bottle. The bottles will be immediately capped and then gently tapped to verify that no air bubbles are present in the sample. If bubbles are detected, the bottle will be discarded and a new sample container will be filled. No specific order is required when sampling for Natural Attenuation Parameters. Unfiltered water samples for metals will be collected. If turbidity stabilizes above 50 nephelometric unit (NTU), then both an unfiltered and a filtered sample will be collected. Filtered samples will be collected following collection of the unfiltered samples. Samples requiring filtration will be filtered using a disposable 0.45 micrometer (µm) membrane in-line filter will be attached to the discharge line of the pump. If filtration is required, a field blank will be prepared using American Society for Testing and Materials (ASTM) Type II Reagent Grade water. The first one-quarter liter of sample water that runs through the filter will used to acclimate the filter and will be discarded. The field blank will be analyzed for the same Target Analyte List (TAL) metals as the filtered well sample. The field blank will be collected using a peristaltic pump. Collected samples will be capped, labeled, and immediately placed on ice.

Required sample containers, preservation methods, and holding times for selected analytical methodologies are presented in Table 3. Pre-preserved sample containers will be provided by the analytical laboratory. The pH of preserved samples will be checked in the field by pouring a small amount of sample onto pH paper. The paper will not touch the sample inside the container. The pH of the preserved VOC samples will not be checked.

In addition to the information required in Section 2.2, the following information will be recorded for each well sampling location:

- a) Depth to water before and after purging
- b) Well bore volume calculation

- c) Sounded total depth of the monitoring well
- d) The visual condition of each well
- e) Field parameter measurement.

2.3 Groundwater Sample Analysis

Laboratory analyses will be conducted in accordance with the ECP. Details of the specific compounds to be analyzed are included in the ECP Quality Program Plan (QPP).

3.0 Field Screening Equipment Calibration and Maintenance

Field equipment will be maintained and calibrated to the standards presented in Table 2.7.2-1 of the QPP, Part 2A and their respective operations manuals.

To ensure that measurements made in the field have been performed with properly calibrated instruments, field personnel will follow the procedures described in the equipment calibration and maintenance owners manual for each instrument.

Equipment failures will be repaired in the field if possible; if not, the instrument will be tagged, removed from use, and returned for repair or replacement. Field equipment will be calibrated daily before the start of sampling activities. Calibration records will be maintained on the Calibration Log (Appendix B). The calibration record will include a unique instrument number (e.g., serial number), standards used, concentrations, and meter readings.

4.0 Equipment Decontamination

The following section describes the procedures to be used to decontaminate sampling equipment. Prior to commencement of field activities, a decontamination area will be established at a suitable area determined by the RANGB representative. All sampling equipment that may directly or indirectly contact samples will be decontaminated before use. This includes the water level indicator and the external surfaces of the peristaltic pump. Decontamination will be completed in the following sequential steps:

- Wash and scrub equipment with a solution of potable water and laboratory-grade nonphosphate detergent.
- Rinse several times with potable water.
- Rinse with ASTM Type II Reagent Grade Water (deionized water).

- Allow equipment to air-dry.
- Wrap in aluminum foil, shiny side out.

All decontamination solutions will be stored and dispensed in proper containers. All fluids generated during decontamination activities will be placed in 55-gallon steel closed top drums. All drums will be properly labeled as to content and shall be staged in a central location designated by the Base representative for temporary storage pending removal and disposal.

5.0 Sample Handling

This section describes the sample identification and numbering system, sample preservation requirements, packaging and shipment procedures, and sample holding times. Pre-cleaned sample containers will be provided by the analytical laboratory through a second-source distribution. The sample containers will be certified to meet or exceed analyte specifications established by USEPA in "Specifications and Guidance for Contaminant-Free Sample Containers."

5.1 Sample Identification and Numbering System

The following information shall be written in the logbook and on the sample label when samples are collected for laboratory analysis:

- Project identification (name and number)
- Sample identification number
- Sample location
- Preservatives added
- Date and time of collection
- Requested analytical methods
- Sampler's name

Each sample will be assigned a unique identification number that describes where the sample was collected. The number should consist of a maximum 12 digit alphanumeric code as follows:

aabbbbccdd

where:

aa represents the site identification

bbbb represents the location number

cc represents the sampling round (e.g. 01, 02, 03, etc.)

dd represents the year of sampling

A list of sample numbers will be maintained by the field coordinator.

Quality Control (QC) samples will be identified by use of a similar system of identifiers with a maximum of 10 characters. The QC sampling number system is summarized below:

xxyyyyyyzz

where:

Represents medium (e.g., ER=equipment rinsate, TB=trip

blank, AB=ambient blank)

yyyyyy Represents date (day, month, year)

ZZ Represents sample number from 01 to 99

The field coordinator will maintain a list that describes how each QC sample corresponds with specific environmental samples. For instance, each trip blank will be correlated with a particular set of samples shipped to the laboratory, and each rinsate will be correlated to those samples collected by a particular set of decontaminated sampling tools.

Duplicate samples will be identified by using the numeral 5 in front of the sampling round identifier (e.g. 51, 52, 53, etc.).

5.2 Sample Preservation Requirements, Packaging and Shipping Procedures, and Sample Holding Times

Table 3 presents sample handling requirements for this project. All samples will be shipped to the analytical laboratory in properly packed and iced coolers in accordance with DOT regulations via overnight courier. Samples will be shipped daily or on alternate days in order to meet parameter holding times.

5.3 Sample Custody

Transportation and custody procedures will meet DOT and USEPA requirements (40 CFR Parts 170-179). Chain-of-custody procedures will document sample possession from the time of collection to disposal in accordance with IT internal procedures and federal guidelines. A sample is considered in custody if:

- It is in the sampler's or the transferee's actual possession.
- It is in the sampler's or the transferee's view, after being in his/her physical possession.
- It was in the sampler's or the transferee's physical possession and then he/she secured it to prevent tampering.
- It is placed in a designated secure area restricted to authorized personnel.

Field custody procedures include the following activities:

- Before sampling begins, field personnel will review chain-of-custody procedures.
- The quantity and types of samples will be reviewed.
- Sampling locations will be finalized and annotated on a site map.
- The field coordinator will determine whether proper custody procedures and report forms were used during the field work and will document findings in the field log book.
- The field coordinator has overall responsibility for the care and custody of the samples collected until they are transferred or properly dispatched to the laboratory. Each individual who collects a sample is responsible for its custody until it is transferred to someone else via the Chain-of-Custody Record.
- Shipment information will be recorded in the field logbook at the end of the shift, day or collection period.

Transfer of custody and shipping procedures include the following activities:

 A Request for Analysis and Chain of Custody (CoC) record (Appendix A) will be maintained in the field by each sampling team for each day of sampling. The white copy of this record will accompany each sample. The yellow carbon copy will be retained at the site.

- Two CoC seals per shipping container will be used to secure the lid and provide evidence that samples have not been tampered with. Seals should be placed such that they span both the lid and the body of the cooler. The seals will be covered with clear tape to prevent damage to the seals.
- If the laboratory sample custodian judges the sample custody to be invalid (e.g., samples arrive damaged), a Nonconformance Report form will be initiated by the laboratory. The IT Project Manager will make a decision as to the fate of the sample(s) in question. The sample(s) will either be processed "as is" with custody failure noted along with the analytical data, or rejected, with sampling rescheduled if necessary. The project manager and quality assurance manager will sign the Nonconformance Report, noting the reason for disposition (nonconformance reports are discussed more fully in the QPP).
- Each time responsibility for custody of the sample changes, the new custodian will sign the record and note the time and date.
- The custody of individual sample containers will be documented by recording each container's identification on an appropriate Request for Analysis and Chain of Custody Record.
- The analyses to be performed for each sample will be recorded on the Request for Analysis and Chain of Custody Record. The original copy accompanies the samples. The copy is retained at the site.
- Upon sample destruction or disposal, the custodian responsible for disposal will
 complete the Request for Analysis and Chain of Custody Record, file a copy, and
 send a copy to the Project Manager or the designated representative for record
 keeping.

5.4 Field Quality Control Samples

To evaluate the reliability of field sampling procedures, field QC samples will be collected or prepared for each media sampled and each sample shipment. QC samples will be used for data evaluation and data validation (described in the QPP).

A trip blank is a VOC sample vial filled in the laboratory with Type II Reagent Grade Water, transported to the site, handled as a sample, and returned to the laboratory for analysis. One trip blank shall accompany every shipment of samples sent to the laboratory for the analysis of VOCs. These blanks will be analyzed for VOCs only.

An equipment blank is ASTM Type II Reagent-Grade Water that is poured over or into, or pumped through, the sampling device, transferred to a sample bottle, and transported to a laboratory for analysis. One equipment blank will be taken by each sampling team on each day of decontamination activities. A minimum of one equipment blank per group of ten or fewer samples will be collected. Sampling equipment blanks shall be collected immediately after the equipment has been decontaminated. This blank shall be analyzed for all laboratory analyses requested for environmental samples collected at the site that day.

A field duplicate is a single liquid sample divided into two equal parts for analysis. One field duplicate will be collected at each IRP site. The original and the duplicate will be analyzed for the same parameters in the laboratory. Field duplicates will be identified so that laboratory personnel are unable to distinguish them from normal field samples.

IT will furnish analytical data or a manufacturer's certification verifying that the Type II Reagent-Grade Water meets the specifications of ASTM D-1193-77 or shows it to be free of analytes and contaminants that may interfere with the required laboratory analyses.

6.0 Record Keeping

The following section describes the field documentation procedures that will be followed as a means of recording observations and findings during field activities. Documentation will include field logbooks, various sample and calibration forms, site photographs, and drawings/sketches. All documentation will be completed in indelible ink and corrections will be clearly stricken out and initialed.

Field Logbook

Logbooks with sequentially numbered pages will be kept at the site during all field activities and will be assigned to each sample team. These logs will be updated continually and will constitute master field investigation documents. Information to be recorded in the logs includes, but is not limited to, the following:

- Project identification
- Field activity subject
- General work activity, work dates, and general time of occurrence

- Unusual events
- Subcontractor progress or problems
- Communication with the client or others
- Weather conditions (ambient air temperature, sky conditions, precipitation, and personal observations of wind conditions).
- IT personnel, subcontractors, and visitors on site
- Sample number and time of day for each sample collected for analysis
- Record of telephone call to laboratory informing it of sample shipment
- Accomplishment of decontamination of drilling rig, construction materials, and sampling equipment
- Accomplishment of required calibration checks
- Accomplishment of well point purging, with time and/or volume
- Disposition of purge water, decontamination fluids, and soil cuttings
- Well water levels and field measurements
- Variances from project plans and procedures
- Accomplishment of tailgate safety meetings
- Review of project procedures with site personnel
- Head space screening and breathing zone readings
- Photographs taken and identification numbers (including location, spatial orientation, and a brief description of the photograph subject).
- Inspections and results of inspections.

Field Equipment Logbook

A field equipment logbook will be kept on site to document the proper use, maintenance, and calibration of field testing equipment. Accompanying the field equipment logbook will be a three-ring binder containing operator manuals, specifications, and calibration requirements and procedures for all field testing equipment. Information to be recorded in the field equipment logbook includes:

- Equipment calibration status
- Equipment decontamination status
- Equipment nonconformance
- Equipment inspection and repair records
- Name and signature of person making entry
- Date of entry
- Name of equipment and its identifying number
- Nature of work conducted
- List or reference of procedures used for calibration or maintenance
- Manufacturer, lot number, and expiration date of calibration standards
- Measurement results.

Sample Collection Log

A sample collection log form will be completed for each sample collected during the investigation (Appendix B). Information to be included on the form includes:

- Date and time of sample collection
- Sample location
- Sample type (i.e., surface soil, sediment, groundwater, etc.)
- Sample volumes and container types.

Photographs

Color photographs should be taken of all sampling sites to record significant field observations or to record site conditions in the case of visual inspections. The picture number and roll number will be logged in the field logbook to identify each picture taken. Prints will be identified with the project number, date taken, and a brief description of the subject, location, and orientation of the photograph.

In addition to the above mentioned documentation, appropriate Installation Restoration Program Information Management System (IRPIMS) data logs will be maintained (Appendix B). Data collected will be inserted into the IRPIMS data base.

7.0 Site Management

The following individuals will serve as contact personnel for field activities:

- AFCEE/ERB Team Chief (TC), Mr. Dan Mooney, (210) 536-5272
- AFBCA/DB Rickenbacker, Mr. Al Friedstrom, (614) 492-8065, ext. 13
- AFCEE/ERB-F, Mr. Dick Haines, (614) 492-8065, ext. 20
- IT Project Manager, Mr. Joe Tyburski, (513) 782-4700
- IT Site Coordinator, Mr. Paul McCarren, (513) 782-4700